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LONDON, SATURDAY, JANUARY 10, 1880.

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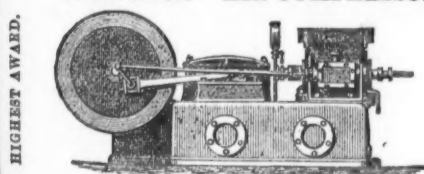


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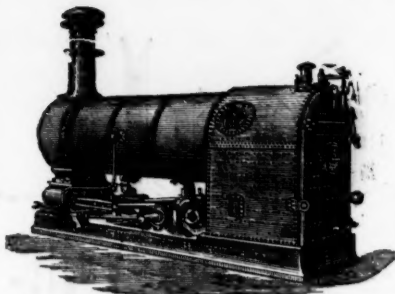
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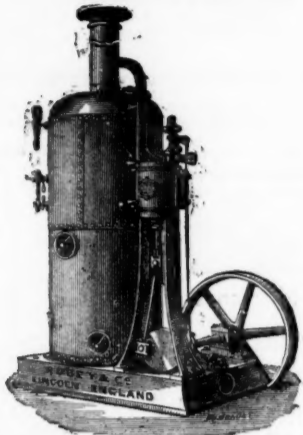
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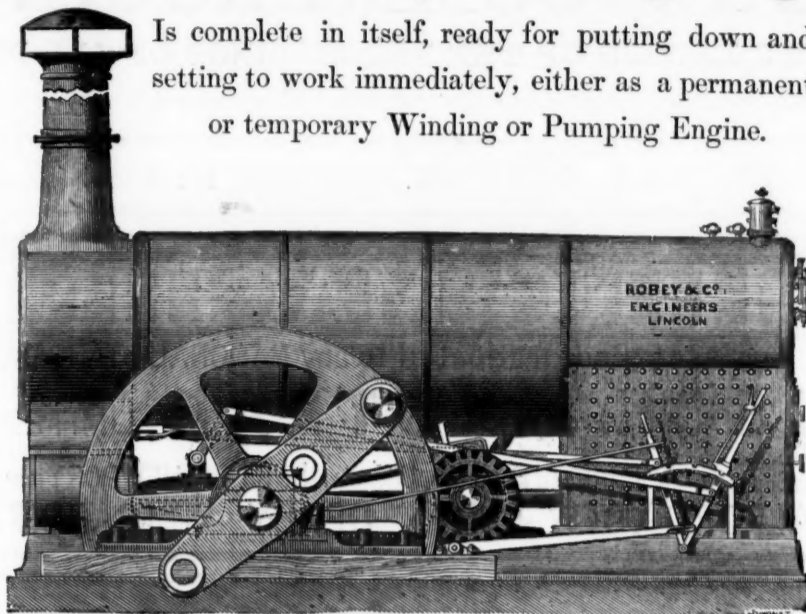
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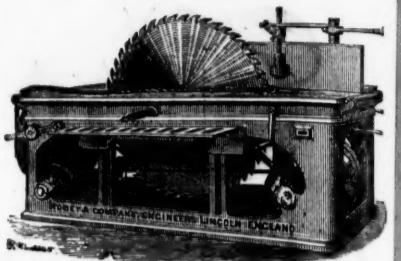


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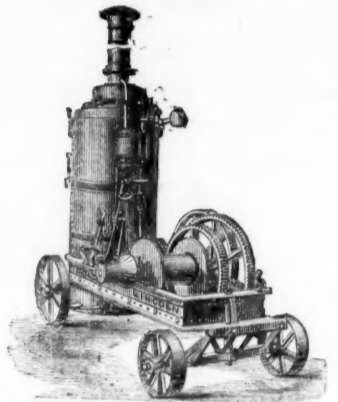
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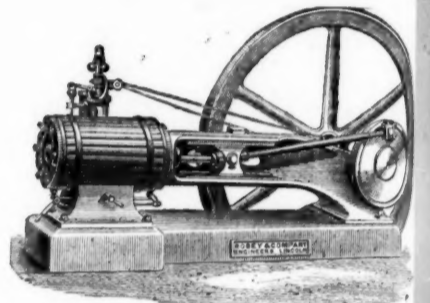
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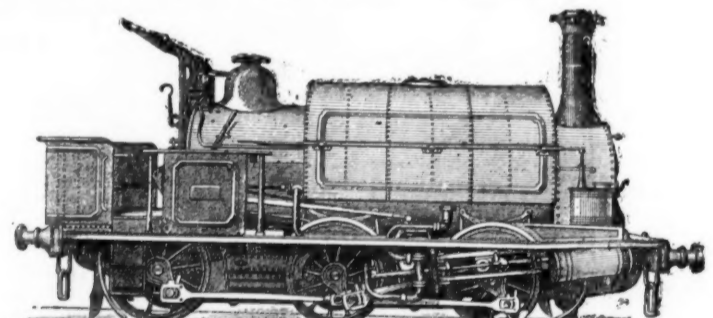
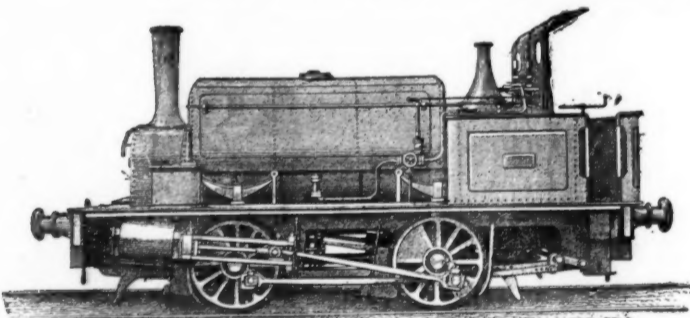
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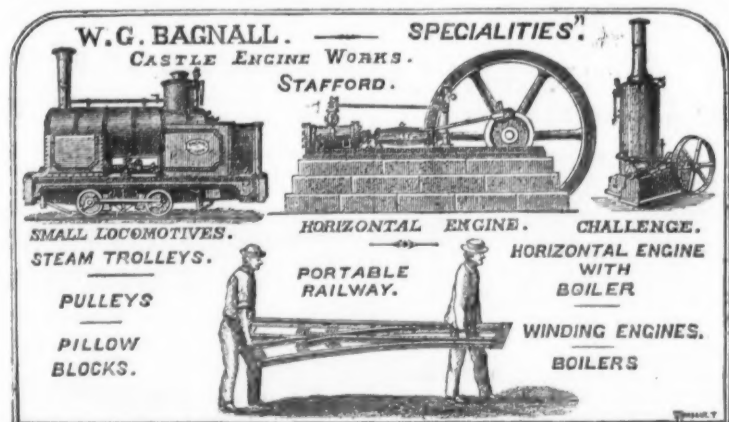
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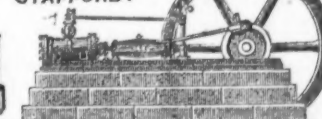


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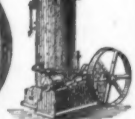
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## Original Correspondence.

## ROYAL SCHOOL OF MINES.

SIR,—I have read with the deepest concern (as have hundreds of others connected with the mining interests of Great Britain) the letter of Dr. Percy, which appears in your last week's impression. Connected as I am with a family of mining engineers dating from generations back, and well knowing, as I do, the disadvantages under which the mining engineer laboured half-a-century ago, how utterly ignorant and incapable he was of properly and economically dealing with those rich mineral resources which have materially assisted in making Old England rich, powerful, and influential, I repeat, with what saddened feelings I put down your paper which informs its readers that the services of one of the most distinguished scientific men of any nation or any time have been lost to the country so far as its School of Mines is concerned, and that the School itself is about to be destroyed.

And what has led to this? Why, because My Lords of the Committee of Council on Education have (most perversely and fatally, I think) for centralising purposes—that they should have a "show" all in one place, a ponderous and expensive machine the works of which are all to be wound up with one key—set their hearts on removing the Metallurgical Department of the School of Mines from Jermyn-street to South Kensington. And here let me say that I have a great admiration of much that has been done at the South Kensington Museum. What has been done with judgment will stand, but when jealousy replaces judgment and ignorant interference disturbs practical work, when the advice of the wise and experienced is disregarded and their suggestions set at naught, and when a tree carefully trained and bearing precious fruit is going to be blunderingly torn up by the root from a congenial soil, then it behoves those who for nearly 30 years have received that instruction, encouragement, and assistance which have fitted them skilfully to do their part in making the vast coal and iron industries of their country what they have become, to take action, and, if possible, prevent such a catastrophe. I warn My Lords to desist, ere they ruin in a day what has taken a wise man and true more than a quarter of a century to build up—a Department which is the admiration of Europe and taken as their model, and presided over by one whose standard works are studied and valued wherever practical science has a school and votaries, or "amid the roar of engines and the clang of hammers, where the strongest powers of nature are trained to work in the fairy chains of art;" who is the greatest living authority on all matters connected with the art of metallurgy, and whose name is revered by hundreds who have been his pupils, and honoured by thousands who know and value his vast personal attainments and private worth.

I call upon every mining and mechanical institution in England at once and without delay to prepare to petition Parliament when it re-assembles that the whole matter may have the fullest investigation, and that the sound judgment, great experience, and eminent ability of Murchison, Smyth, Ramsay, Percy, and Hunt may be respected, and their advice followed in this all important matter, and not allow the result of their genius and industry to be destroyed for the sake of a whim of centralisation.

COAL AND IRON.

Birmingham, Jan. 7.

## ON THE MANUFACTURE OF IRON AND STEEL.

SIR,—The most recent improvements and inventions with regard to iron and steel manufacture were probably shown at the late Exhibition in Paris. The Bessemer steel productions have been described by Mr. Akerman, of Stockholm. Though this manufacture is but of a few years growth, it is causing a complete revolution in the iron trade. Mr. Bessemer's invention has been assisted by the regenerative principle of Dr. Siemens, which has rendered possible the fusion of iron and steel at a diminished cost. At the present day many works engaged in the Bessemer steel manufacture not only use inferior materials to those used in the first period of the manufacture, but none any longer try to conceal that they make steel by the Bessemer process. Bessemer rails are fast supplanting rails made from puddled iron. Bessemer rails are rolled at Seraing 180 ft. in length; at C. Cammell and Co., Sheffield, 141 ft., these being rolled direct from the ingot. The Exhibition of 1878 showed conclusively that Bessemer steel is not now confined to the manufacture of rails, as it was at first, but that it and Siemens-Martin steel is used in most countries for many other purposes, and the quality of the steel ingot depends not so much on the principle (whether Bessemer, Siemens-Martin, or crucible) as on the quality of the crude materials used for the manufacture. Heavy chains of Bessemer steel welded in the ordinary way are made in France and at Sheffield by Brown, Bayley, and Dixon. Railway wagon couplings, screw bolts, and rings for cannon are also made in France. At works in Hungary, in Russia, and at the West Cumberland Iron and Steel Works boiler plates of Bessemer steel are made.

The superior quality of Bessemer and Siemens-Martin plates over puddled iron plates has been demonstrated by experiments. The steel ingot plates stood from five to nine blows from a weight falling 14½ ft. without any failure, while Swedish puddled-iron plates only stood four to six blows of the same weight from a height of 5-9 ft. When the fall of 5-9 ft. was used as a test on the ingot plates they withstood 25 blows; on the other hand, with the fall of 14½ ft., when acting on the puddled-iron plates, the weight passed through them at the first blow. Tests were made with the ingot-plates with falls from a height of 29½ ft., when they withstood before fracture three blows. The ball used as a falling weight in the experiment weighed 1925 lbs.

In these experiments it was found that the Swedish puddled plates contained from .016 to .021 per cent. of phosphorus; the Yorkshire plates, .094 to .125 per cent.; and the Staffordshire plates, .248 per cent. Besides this difference in phosphorus, the Staffordshire plates contain a large quantity of silicon. No special difference could be discovered between Bessemer and Siemens-Martin plates, though the tests embraced both analyses and tensile strength, but the latter seemed to have somewhat greater ductility, with the same percentage of contained carbon. An ingot from Creusot Works, made by the Siemens-Martin process, weighed 120,000 kilogrammes—about 264,552 lbs.

The firms of John Brown and Co. and C. Cammell and Co. make their heavy armour-plates partly of Bessemer ingots. These plates consist of half of ingot steel and half of puddled iron. The largest armour-plate shown at Paris was made of puddled iron, its length being 13-94 ft.; breadth, 5-29 ft.; thickness, 2-313 ft.; and weight, 38,022 kilogrammes=83,823 lbs.

To make Bessemer or Siemens-Martin steel of a proper degree of softness the supply of ferro-manganese compounds came into use; it was found the richer in manganese the added substance was the less carbon was contained in the final product, and it could be made so much the softer. The supply of ferro-manganese has led to the employment of a new method for utilising worn-out rails. It is known that the phosphorus has in a certain degree the same influence on the qualities of iron as carbon has, for each of these substances diminish the ductility of the iron, but increase its hardness, limit of elasticity, tensile strength, and disposition when heated to assume a crystalline form, with a resulting difficulty of working at a very high temperature, and brittleness in the cold state. The great difference between the influence of these substances is that the action of the carbon is much greater than that of phosphorus in improving the qualities of iron by increasing its hardness, limit of elasticity, and tensile strength, while the influence of phosphorus far surpasses that of carbon in deteriorating its qualities by increasing the disposition to form crystals, and by diminishing the ductility. It has also been ascertained that the influence of phosphorus on the qualities of iron is much increased by the simultaneous presence of a considerable percentage of carbon.

Crucible melted tool steel is made by adding pig-iron rich in chrome. The iron compound richest in chrome, containing thereof up to 65 per cent., was made at the steelworks at Unieux, near St. Etienne, by the reduction of chrome ore with charcoal in the crucible. The tension tests to which this steel and the chrome steel from Terrenoire have been submitted confirm the opinion previously given in other quarters that chrome still more than carbon increases the hardness as well as the limit of elasticity and tensile strength, while it

does not diminish the ductility so much as carbon. The action of chrome seems to be advantageous, and resembles that of tungsten, though in a more powerful manner. Holtzer's steel is said to contain 2-5 per cent. of chrome. Seebohm and Dickstahl, of Sheffield, make steel containing only 1 per cent. of chrome.

M. E.

## CARRIAGE BY RAIL OF NITRO-GLYCERINE EXPLOSIVES.

SIR,—The question of the carriage by rail in this country of nitro-glycerine explosives is frequently agitated by those interested, and is one of considerable importance to the public. No doubt serious risks may be sometimes incurred by illicit transport on our railways of that class of explosives under other names, but this cannot become very general, for, in this country at least, we have a well organised and active Government department of inspection and protection against this character of danger, and if ever it be thought desirable to overrule the objection of our home railway authorities Government officials will make very stringent regulations for the defence of the general public.

In India, however, the purveyors of nitro-glycerine compounds appear to have met with remarkable success in removing on some lines all restrictions to its transport by rail, if we may trust the following editorial, copied from a late number of the Times of India:—

"We hear that the authorities have sanctioned the conveyance of dynamite over the Scinde-Punjab and Delhi and the Punjab Northern and Indus Valley State Railways, and that Messrs. M— and Co. are going to dispatch a quantity to Kurrachee at once for use on the Northern State Railway. Now that railways all over India are willing to carry dynamite it is surely high time for the authorities of the Great Indian Peninsula to make up their minds to forego the policy of obstruction which they adopted without rhyme or reason at first. It is certainly hard on the enterprising importers that the ignorant fears of one local railway official should be able to close the important railway that connects Bombay with Madras and Bengal, and thus shut out the chief markets in India from this economical, useful, and safe explosive."

I hold that if such sanction as that here announced already obtains it proves rather the carelessness of the authorities who allow than the ignorance of those who prevent disguised nitro-glycerine being scattered about by rail. The ignorance of the general public as to the dangers or merits, or special characteristics, of the two great families of advanced explosives is not to be wondered at, considering how recent is their origin. Though their extension is wide, their literature is still buried in engineering reports, experts' notes, and the proceedings of scientific societies, while commercial "enterprise" has been interested as much in deluding as in enlightening the public.

I may mention that some time ago I proposed lecturing to a society of which I am a member on the subject of modern explosives, when an acquaintance interested in industrial science, fearing that I intended making common certain details familiar to both of us, begged me to be cautious as to what I disclosed; and pointing out, as an example to be followed, the lecture of a certain very able chemist which we had lately attended, he exclaimed—"Oh, what an admirable lecture that was! He told the audience nothing!"

In protesting, therefore, against the folly of the course advocated by the Times of India, I trust you will allow me to note a few facts which may illustrate the characteristics distinguishing the family of nitro-glycerine from that of nitro-cellulose.

Soon after its introduction by Sobrero in 1860 the oil of glonoin, or nitro-glycerine, gained for itself unenviable notoriety by its fearfully sensitive and destructive character. The panic produced by such warnings as the Newcastle explosion—in which the mayor of that town, the carter he engaged, the wagon and the horses employed in the removal, with a view to its destruction, of some frozen nitro-glycerine were all annihilated, without any apparent cause for the explosion—would soon have led to the abandonment or prohibition of the use of this agent but for the discovery by Mr. Nobel of a means of muzzling it to some extent, with a view to its safe transport, by uniting it with an absorbent vehicle, such as Kieselguhr earth, under the name of dynamite.

Nitro-glycerine in Kieselguhr earth has accomplished valuable service for industrial progress; the union is, however, only mechanical. Exudation is frequent and inevitable, as shown by the constant saturation of the paper envelopes of dynamite—then, practically, nitro-glycerine with all its untrammelled terrors is present; it may stand a considerable amount of percussion, yet explode with mere rough usage. We have reports of dynamite cartridges being exploded by pricking with a needle, by a fall, and even exploding in drawing off the string of the package in which they were placed. More alarming, however, are the frequent instances in which, during the process of thawing, explosions of dynamite have occurred; because dynamite and all its congeners, or at least the nitro-glycerine in them, freezes at 43° Fahr., ordinary climatic changes must cause frequent alternation from its frozen to its thawed condition. Most terrible of all are the numerous instances of accident from utterly unaccountable explosions of dynamite, some of which were at one time attributed to "fractures of the crystals of congelation." This theory, however, Major Majendie's latest experiments have shaken, and we can only fall back on the newspaper expression—"spontaneous combustion"—such combustion meaning not mere deflagration, but explosion, and the expression being in no sense an explanation.

The Canadian papers have lately been filled with reports of enquiry into the recent terrible and destructive accident attending the conveyance by rail of dynamite and dualine, both disguised of that deadly and treacherous syrup—nitro-glycerine. During last month we have heard of the destruction in France of two dynamite factories by explosion—one at Paulille, near Perpignan, and another at Honfleur—besides the fatal explosion at Pertehead, near Aberdeen; and, strange comment on the views of the Times of India, a fatal accident from dynamite in the harbour of Bombay.

I would beg the especial attention of those who believe that we have already obtained sufficient control over nitro-glycerine to warrant its transport by rail to the following incident, as reported in the London Times of August 9, 1878:—

"Bucharest, August 8.—A terrible explosion of dynamite took place yesterday at Pratesti, near Giurgievo. A number of Russian soldiers were loading a railway wagon with boxes of dynamite taken from a neighbouring magazine, when one of the boxes fell to the earth and exploded, setting off at the same time the remaining boxes in the wagon. The effects of the explosion were terrible. Fifty soldiers were killed and thirty-five wounded, some of them dangerously. Six railway wagons were blown to atoms, and the station was shattered."

While writing this the account comes to hand of the explosion of a magazine at Amherstburg, Ontario, in which a compound of nitro-glycerine and mica powder was stored, the effects of the explosion having been felt for a distance of 40 miles. And, more recent still, it is announced from Pesth "that several lives have been lost through an explosion in thawing dynamite at a brickworks at Alt Ofen."

No month, indeed, passes without similar reports, for this "Dance of Death" is being going on in every country in which the manufacture and use of nitro-glycerine and its compounds is not prohibited ever since its invention, because the public are, as a rule, ignorant of the fact that these risks are no longer necessary, inasmuch as the so-called "powders" produced from nitro-cellulose are now as powerful, as economical, but far more stable than those compounded with nitro-glycerine. Nitro-glycerine is the vitalising principle or active agent in dynamite, lithofracture, dualine, Hercules powder, giant powder, vigorite, *et hoc genus omne*; while nitro-cellulose gives the explosive energy to gun-cotton, wood powder, wet cotton (as used in our army and navy), nitrated cotton, and tonite—an improved form of nitrated and condensed cotton powder. This last is carried upon all English railways as freely as common powder, but they rigidly exclude all the compounds of nitro-glycerine, and the common sense of this distinction is proved to a demonstration by experience. The explosion of tonite is thoroughly honest, it has no mysterious or unaccountable character, no amount of violence or rough usage has ever been able to explode it, and it requires for detonation double the strength of fulminate sufficient for dynamite. Berthelot has proved by direct experiment that the ability of the two compounds—nitro-glycerine and gun-cotton—to withstand disruption is proportioned to the heat generated in their chemical formation, and it is a singular practical proof of the correctness of his conclusions that if anyone succeeds in extracting the fulminate of a dynamite and a tonite detonator he will find them to amount to about 7 grains and 13 grains respectively. The specific gravity of the best dynamite and tonite is identical, and with that density the tonite is much the stronger of the two. Nitro-glycerine is poisonous, however, in the usual course being either through the pores by accidental smearing or through the lungs by inhaling when dispersed in the atmosphere from incomplete ex-

plosion. The fumes of gun-cotton, like those of dynamite, occasionally produce carbonic oxide, 1 per cent. of which in air is fatal to life. It is supposed that fully nitrating cotton prevents this danger, but I, for one, would be very sorry to risk the experiment of breathing the fumes of nitrated cotton if imperfectly exploded. This question of the fumes of carbonic oxide is very ably illustrated in the reports of the Government Inspector of Explosives on the Severn and Halkyn Tunnel accidents. In the former two men were killed by the fumes of dynamite; in the latter one was killed and eleven seriously affected by pure non-nitrated gun-cotton.

I have made the comparison between dynamite and tonite chiefly, both on account of the special reference to the former in the paragraph quoted at the commencement of this letter, and also because they are fairly representative of the two families to which they belong. The new blasting gelatine of Mr. Nobel has not yet attained to commercial importance. Experiments with it have been very limited. Of its great power there can be no question, but it would be premature to attempt to estimate its deserts either in the direction of economy, safety in transport, or sanitary security as to the gaseous results of its explosions.

I trust I have said enough to prove that the resolution of the Great India Peninsular Railway not to risk the carriage of dynamite was probably not taken entirely "without rhyme or reason."

Jan. 3.

KEITH LESLIE.

## KEARSLEY COLLIERY EXPLOSION.

SIR,—It would be very instructive to many of your readers if you were to give a plan of this mine in the Journal, showing the Plodder Mine workings where the explosion occurred. One feels inclined to ask what would have been the result if when the explosion occurred there had been 15,000 instead of 1500 cubic feet of air per minute passing through the working? Would not a great proportion of those injured have been killed outright?

AN ENGINEER.

## THE NORTHERN COALOWNERS.

SIR,—With reference to my letter in the Journal of the 3rd inst., to dissipate any semblance of "equivocal" the Gas Light and Coke Company, although their Act, 36 and 37 Vict., cap. cxvi., empower them "to purchase, maintain, and use collier ships, &c., are receiving week by week by rail from Sir George Elliot 3000 tons of his coal from Usworth, in the county of Durham, which the Great Northern Railway Company inform me is carried at a special rate. Their regular rate is 10s. 5d., and trucks 1s. We have here the mode of procedure of one of the M.P.'s for North Durham. Let us observe the contrast in the conduct of the other M.P., Mr. Charles Mark Palmer, who, in a paper read at the British Association Newcastle meeting, 1863, stated "The sale of North Country coal in the London market began to be seriously affected about 1850 by the carriage of coal by railway, which rendered it necessary to devise some means of cheap conveyance in the construction and working of screw colliers."

Mr. Palmer was the pioneer of the screw collier system, and who further stated "To the success of this experiment is to be attributed the fact that we continue to supply the London market so largely, the introduction of the screw collier having revolutionised the coal-carrying trade." Had a baronetcy been placed at the disposal of Mr. Palmer he would, in the event of accepting the same, have justly merited it at the hands of the nation, and no one could have imputed the honour conferred to a mere jobbery or political party matter, the recipient in well known cases paying dear for his whistle. The screw collier with my improved practical appliances will annihilate all coal transport by rail to London. I ask the Northern coalowners where is their consistency, if all be true of their London meeting that has been related to me by an unquestionable source?

Little Tower-street, Jan. 6.

W. JOSEPH THOMPSON.

## THE BILBAO IRON ORE TRAFFIC.

SIR,—My correspondence in the Journal of November 15 and 1; October 25, 18, 11, and 4; September 27, 13, and 6; and August 30, 23, and 16; must have carried conviction that the Gillivare iron ore or iron (even were it possible to imagine the installation of a surface railway in Lapland—the land of snow, which was rejected by the original Gillivare Company in liquidation as impracticable) cannot contribute to the supply of this country. Bilbao and the North-West of Spain with the installation of my improved practical system of transport are destined to possess a brilliant future. The cost of transport from the various points of extraction to ports of shipment and destination I am prepared to prove can be effected at a saving of more than a moiety of existing rates of land and sea transport, which will cause an immense rebound in the deplorably depreciated value of investments of English capital in Spanish iron mines (of which I have numerous offers), free from sulphur and phosphorus. Handicapped so heavily as Belgium is with duty on the raw material, sea and land transport charges, and the same back to England, the Belgian ironmakers beat the English in the very great iron-making districts of England. Having visited the chief ironworks in the Liège and Charleroi districts, and effected the largest sale ever made in this country of Belgian iron, I can prove that predicted is solely attributable to improved appliances. Improved means of transport will relatively effect still more important results from the iron ore districts of Spain.—Little Tower-street, Jan. 6.

W. J. THOMPSON.

## CHEAP SODIUM AND ALUMINIUM.

SIR,—An abundant supply of cheap sodium is of such great importance in connection with many metallurgical operations that I think Mr. W. P. Thompson, of Tranmere, may fairly be congratulated upon having devised a cheap process of manufacturing the metals of the alkalis, &c., more especially as the invention, not being secured by patent, can be used by anyone. Its object is the manufacture of certain metals having a great affinity for oxygen, more especially of sodium, potassium, and aluminium, in a cheaper manner than hitherto, and without forming the black detonating compound so liable to form in the ordinary process of manufacturing potassium. It consists mainly in the use of fluid iron, or a fluid alloy of iron, as a reducing agent, or as an assistant to the actual reducing agent, hydrogen or carbon. The reduction takes place in a converter somewhat resembling the Bessemer steel converter. As arranged for making aluminium direct the form of converter he prefers to adopt is a chamber on trunnions with a single orifice, but divided below into two lobes, each capable of containing a heavy charge. The chimney and the entrance to a chamber hereafter described are so arranged that when one lobe in bottom the orifice opens into the chimney, and when the other lobe is bottom the orifice opens into the chamber. A projecting shield on the converter or otherwise closes the mouth of the chamber when the orifice of the converter is directed to the chimney. At the bottom of the lobe, which is lowest when the orifice of the converter faces the chimney, is the ordinary air blast. At or near the bottom of the other lobe are two tuyeres or sets of tuyeres, arranged so that their streams shall tend to quickly intermingle. One of these is for hydrogen or hydrocarbon gas, the other for the chloride or fluoride of the metal to be reduced, or the double chloride or fluoride of it and another metal.

Each lobe is capable of containing the entire charge, and is arranged at such an angle that the contents can be poured from one lobe entirely into the other. Iron or an alloy of iron being poured into the air lobe a blow commences, and when it is a little heated the contents are poured into the second lobe; and in the case of aluminium manufacture, hydrogen or a hydrocarbon, and the chloride or fluoride of aluminium, or double chloride or fluoride of aluminium and sodium are forced in, preferably in the melted or gaseous state. The hydrogen takes the chlorine or fluorine, and gives it up to the iron. The hydrogen and chloride or fluoride of iron escape into the chamber, where the latter is condensed, and the former is drawn off for re-use. The carbon of the hydrocarbon and the aluminium remain behind. When the mixture begins to cool it is turned into the blowing chamber, and the carbon oxidised. It is then turned back, and pure hydrogen only is used for reducing, and after all the carbon is burnt off, and the iron is nearly used up, a portion of the alloy of iron and aluminium is poured off into a ladle, and a fresh charge of cast-

iron poured in. The entire contents could be changed, but as the alloy of iron and aluminium is fusible at a lower temperature than cast-iron he thinks it will be found best always to keep some aluminium in the converter. For the lining of the converter a mixture of lime, magnesia, and alumina will probably be found best.

For sodium manufacture the apparatus is much simplified; no hydrogen is used, and only enough carbonaceous matter is forced into the iron as is required to act as fuel in reheating. Iron being poured into the converter, as before, caustic soda is forced in. The carbon in the iron takes up the oxygen, and the sodium escapes and is condensed in the chamber. When all the carbon is burnt off the iron can be made into Bessemer steel, and a fresh charge inserted; or it can be re-carbonised by a strong Bunsen blast, with excess of carbon in the air chamber, or, if desirable, can be oxidised away. If potassium is required a waste of iron is necessary, as pure iron only can be used, or an alloy of iron with some difficulty oxidisable metal. Great waste will in any case occur, as iron and potassium form an alloy, and this process is consequently not so well adapted for potassium as sodium. If very pure aluminium be required sodium must be manufactured, as above, and the chloride or fluoride of aluminium placed in the chamber. The chamber must be kept at such a temperature that the flux of chloride or fluoride of sodium remains very liquid. A stirring apparatus can also be employed to gently stir the mass, so as to let the shots of aluminium agglomerate. When a sufficient quantity is collected the aluminium and slag can be partially tapped out. The chamber must be lined with calcined alumina or other basic or neutral material, and should have at one end a raised bed, into which the aluminium salt is thrown from a double valve hole at the top, arranged so that no air can get in. The aluminium formed in this way will be nearly pure calcium, magnesium, strontium, and barium salts can be treated as well as those of aluminium, so that the invention is capable of extensive application.

Chester, Dec. 27.

SODIUM-AMALGAM.

#### REMOVAL OF GASES FROM METALS

SIR,—As we have heard much of late about improving the quality of metals by removing occluded gases from the molten mass, I should like to learn what in the opinion of practical men are the advantages and disadvantages of the invention of Mr. R. Aitken, of Great George-street, which is really a proposal for casting in a vacuum. Although he describes several modifications in detail, the principle will be sufficiently understood by reference to one of them. According to this the molten metal from which it is proposed to extract the occluded gases is placed in a ladle or trough, or in the case of steel it may be poured into ingot moulds, or if it be Bessemer remain in the converter; and on the top of this ladle, trough, ingot mould, or converter he places a cover which hermetically closes the vessel. He then, by pipes or otherwise, connects the space over the molten metal with exhausting air pumps, or otherwise makes a vacuum more or less perfect over the molten metal, so that the gases occluded or shut up in the metal will expand, and thus rise and leave the metal nearly free from gas, thereby producing metal of a close homogeneous character. In treating steel in ingots by this process it is desirable that the mould should be heated before the metal is poured into it.

The difficulty which strikes me in connection with the invention is that no vacuum capable of inducing the metal to part with the occluded gases, and that, even assuming such a vacuum to be possible, a casting made therein would be no better than one made in the open air, owing to the iron being really relieved of the pressure which consolidates it, and gives it homogeneity.

Birmingham, Jan. 6.

MECHANIC.

#### NEW DOUBLE ROTATING BUDDLE.

SIR,—Although it may be somewhat difficult to recognise at a glance the connection between a coaxial umbrella and a round buddle it appears that under the former name a practical diamond washer—Mr. Samuel Stonestreet, of Kimberley, Griqualand West—has invented a kind of double rotating buddle for coaxing the diamonds out of the worthless gravel in which they are usually found, and it is not unlikely that this coaxial umbrella would prove equally useful to coax other valuable ores out of the matrix in which they are found, especially with some little modification, which with some little knowledge of dressing ores for market I may venture to suggest, and which, moreover, will not in any way infringe the patent which has been obtained in Great Britain for the coaxial umbrella. Mr. Stonestreet's invention, which seems to have been slightly modified by Mr. T. Allen, C.E., of London, and Mr. J. N. Paxman, the well-known engineer of Colchester, and they state in their provisional specification that the invention relates to improvements in machinery and apparatus employed in washing diamonds and other analogous substances, whereby an equable distribution of "puddle" in an annular trough is obtained, cleaning out the machine facilitated, and the loss of diamonds, which so often occurs in the ordinary rotary machines, rendered impossible. A hollow cone, which they called the "umbrella," made of wood or other suitable material, is fixed to a vertical shaft vertex upwards, the axis of the shaft being coincident with the axis of the cone. On the end of the shaft which protrudes above the vertex umbrella is a hopper, called the "supply hopper." From the lower end of the shaft, and a right angles to it, radiate a number of arms, on each of which vertical knives are placed at intervals. The extremities of these arms are supported by being fixed to the rim of the cone or umbrella mentioned. The shaft is supported by framework and bearings, and revolves on its vertical axis together with the "supply hopper," umbrella, and arms. The arms revolve in an annular trough, the base of which is an inverted cone, the annular trough being coaxial with the upright shaft. The annular trough is supported by the framework. The conical base of the annular trough is not continued to its vertex. A frustrum is removed, and in its place is an overflow hopper. The diamondiferous soil is first broken up, and with the addition of water passed through a circular puddler and sieve or riddle, which separates and prevents all large pieces of rock or stone passing into the machine. The puddle then flows through a supply shoot in the supply hopper. From the supply hopper the puddle flows down the surface of the cone or flat shoots, as the case may be, thence dropping into the annular trough, where by specific gravity and centrifugal force the heavy particles, such as iron, stone, pyrites, ilmenite, diamond, and garnet are retained in the machine, and the lighter portions of the puddle, such as mud, sand, gravel, &c., flow over the edge of the overflow hopper.

It was subsequently ascertained, certainly within six months of the date at which the above description was filed, that a round buddle could be described by a more technical name than "umbrella," so that the removal of the frustrum of an umbrella became unnecessary. During the same period it was likewise ascertained that the apex of a cone is not necessarily a frustrum, and that a cone standing on its base cannot properly be described as inverted. Practically speaking, Mr. Stonestreet's invention consists of two convex round buddles of different slope, both on one axis, the lower buddle being furnished with a high run to convert it into a trough, and thus permit the lighter stuff to be washed through the hole left in the lower buddle. The upper buddle rotates and carries on its under side a series of knives or scrapers, which agitate the stuff which has been washed from the upper and steep-sloped buddle into the lower trough buddle. It is explained that the distributor, which was before called the umbrella, made of iron, steel, wood, or other suitable material is fixed vertex upwards to a vertical shaft, the axis of which is coincident with that of the cone. Fixed on the shaft and coaxial with it above above the distributor, but in connection therewith, is a hopper, hereinafter called the "supply hopper," having outlet holes at its lower edge opening on the distributor. The distributor may have on its upper surface a number of guides forming channels from the outlets of the hopper to its own periphery. The periphery or run of the distributing cone is connected with the shaft by a number of fixed radial arms at right angles to its axis, on each of which arms vertical knives are fixed at intervals. The shaft which thus carries the distributing cone and the radial arms fixed to it is supported by suitable framework and bearings, and is provided with suitable gearing either to its upper or lower, preferably at its upper end, by which it may be caused to revolve. The radial arms and the knives, hereafter called the "agitators," revolve in an annular trough made in

the shape of the frustrum of a cone, coaxial with the shaft, and supported by suitable framework. The bottom and sides of this trough are made perfectly smooth, without projecting rivets, bolts, joints, or anything to interfere with the action of the agitating knives. The top of the frustrums has a raised rim lower than the outer edge of the trough, and thus forms an inner concentric overflow.

Now, it appears to me that there is here the germ of a good idea, but it is badly carried out. The placing of two buddles on one axis is good, but Mr. Stonestreet's arrangement of them is complicated and inconvenient; that is to say, if the arrangement is to be used for the treatment of minerals generally. The object of buddling should be to pass the stuff over the largest possible surface with a given expenditure of power, and to collect all that is saleable with the least possible manipulation of either ore or refuse. This, I think, it will be obvious can best be done by arranging a rotating concave buddle over a fixed convex buddle, letting the stuff fall from the concave on to the convex. On the underside of the concave buddle there would be the usual scrapers, brushes, &c., to act on the convex buddle, and the shaft would be continued upwards, and provided with radial arms to carry the scrapers, brushes, &c., required for the concave buddle. Both buddles would, of course, be provided with the usual appurtenances for collecting the separated mineral, and the refuse leaving the lower buddles would be absolutely worthless. It will be seen that this arrangement has many advantages, not the least being that the surfaces of both buddles can be most conveniently got at so as to afford every facility for seeing what is going on, and correcting any slight irregularity. I may take this opportunity of remarking that if matters of this kind were more fully discussed by mine captain and captain dressers great benefits would result to one and all.

Truro, Dec. 29.

ENGINEER.

#### THE SUOMI PUMPING ENGINE

SIR,—I think you will admit that a direct acting engine, using steam expansively in a single cylinder, with one steam-moved valve, and govern their motion themselves, without any gear either for the governor or the valve, is a novelty; and as I observe that you permit correspondents to describe inventions in your columns I should like to explain this one, about which Mr. Crank, of Moreton Terrace, Pimlico, can furnish more particulars if you wish it. The engine in question consists of a common cylinder, with a valve chest containing a single slide valve, with either plain or cylindrical face, a common pump cylinder, with the necessary valves and air-vessel connected to the steam cylinder by means of a distance piece, or a bed plate, or both. The pump piston is connected directly to the steam piston by a piston-rod, and the thus connected pieces move altogether by themselves, without in any way interfering with the valve motion. The single slide valve is moved entirely by the steam without any tappets or valves. For giving the motion to the valve there is at each end of it a plunger fitting into a corresponding cylinder at the end of the valve chest. In the bottom of each valve cylinder are three holes, of which the innermost lead to the exhaust and the outer ones to different parts of the steam cylinder. In the bottom of each plunger is one hole leading to the back of it, which when the valve moves passes over the holes in the cylinder bottom. Except through this hole there is no connection between the steam cylinder and the valve cylinder, as the plunger covers the holes.

Now, we will suppose that we call one end of the steam cylinder the front end and the other the back end, the valve cylinder in the same way, and the holes in the cylinder bottoms are numbered from the ends towards the centre, then the holes 1 and 2 in both valve cylinders lead to the steam cylinder, and the holes 3 to the exhaust, and the manner in which the steam will act on the valve will be this:—When the piston is at the front end of the stroke the valve is at the back end, admitting steam to the front and exhausting it from the back. The hole in the front plunger is over the hole 3 in the front valve cylinder, so that the steam previously behind the plunger passes into the exhaust, and the hole in the back plunger is over the hole 1 in the back valve cylinder. When the piston has passed a short distance the steam behind it gets through a hole in the cylinder barrel, and the back hole, 1, behind the back plunger pushing the valve towards the front. As soon as the valve has passed so far that the hole in the back plunger is over the hole 2 in the back valve cylinder, which leads to the end of the exhaust part of the steam cylinder, the steam rushes away, and the valve stops, closing the steam admission to the front, and leaving the exhaust from the back full open. The steam in the front end of the steam cylinder then expands during the rest of the stroke, and when the piston reaches the back end the steam gets into the hole 2, and finishes the stroke of the valve, so that steam is admitted through the back port and exhausted through the front port. The holes 1 and 2 in the front valve cylinder can be arranged so that the back of the front plunger is not in connection with the steam in the cylinder before the valve has opened the corresponding exhaust, and any disturbances can thus not occur in the valve motion. The action of the steam on the valve is the same during the back stroke. In starting the engine the valve is moved the first time by a hand lever.

But the engine need not be made to work expansively unless one likes, but if it is to work without expansion the holes 1 are left away, and the holes 2 shifted in their places. If the engine is to work with fixed expansion the above arrangement is sufficient. A variable expansion regulated by a gearless governor is provided by a very simple arrangement. To the cover of one of the valve cylinders a small cylinder is fixed. In this cylinder a piston works which is connected by a rod to the valve plunger, and moves thus with the valve. The ends of the small cylinder are connected by a canal in the side, which is closed more or less by a small sluice. At the end of the sluice rod there is a piston working in a second small cylinder, which is fixed to the first one. The bottom of the second cylinder is through a small pipe in connection with the delivery pipe above the air vessel, and the head thus always tries to press the second piston upwards and shut the sluice. The second piston is kept down by a spring, which is adjustable by a handle. The water which leaks through the second piston is taken away by a pipe fixed to the top of the second cylinder, and the water can, through a hole round the sluice spindle, fill the first cylinder. When the slide valve moves the first piston there is a certain resistance when the water passes the sluice, which resistance increases if the sluice, through increase of the head, is lifted higher, and decreases if the water pressure decreases either by lessened head or through an increase of velocity in the delivery pipe, caused by greater pressure of the steam. The cut off is thus later if the head is greater, and quicker if the steam pressure is greater. When the spring is adjusted so that the engine runs with a certain speed it will govern itself under any circumstances. To allow the valve to pass quicker at its second motion, when the steam admission occurs, there are in the first cylinder, besides the connection past the sluice, also connecting canals from each end to the points corresponding to those where the valve stops for expansion. These canals are shut either by one drop valve at the centre opening inwards, or one at each end opening outwards, so that all the water must pass the sluice at the first part of the valve stroke, and at the second part can take an easier way. I need hardly say that this valve gear can, of course, even be applied to engines for other purposes, and another cylinder could be added to the engine to make it compound.

Pimlico, Jan. 5.

HERMANN.

#### THE PANULCILLO COPPER COMPANY.

SIR,—Since writing you last anent this mine (it was, I think, in November) I have received the manager's monthly report for October last, dated Panulcillo, Nov. 1. I beg to call the special attention of your readers to that report, as it affords me conclusive proof that my former communications were not at all over sanguine, but, perhaps, rather under the mark than otherwise. Whilst Mr. Welsh's estimation of monthly production was from 32,000 to 35,000 quintals metric, they reached in October the high total of 48,000 quintals. Modestly he states in his report that the production has exceeded his expectations, but he does not say to what formidable degree. With such an increased output, and the present brilliant prospect of the copper market, I must stronger than ever adhere to my conviction that 50,000 net profit per annum is now the reasonably lowest estimate of the Panulcillo Mines. And it is truly astonishing to find

that shares with dividends in store at the rate of 25 per cent. upwards are still only at a small premium, when we see other copper shares, which have no such prospect in my opinion, such as Rio Tinto and New Quebrada, at par or nearing it. The turn for Panulcillo, however, will and must come by-and-by inevitably, and those who did not buy at the right time will soon regret their shortsightedness when they see Panulcillo shares again at their old level, which is considerably above the present one.

Jan. 8.

A PERMANENT SHAREHOLDER.

#### NEW MEXICO—ITS FUTURE IMPORTANCE FOR COPPER PRODUCTION—THE CONSOLIDATED NACIMIENTO COPPER MINES.

SIR,—At earlier opportunities I have reported on the copper mines in the Tuerto Mountains, New Mexico, also on a copper ore occurrence in Abo Pass, and from other sources your Journal had reports concerning copper mines in the south-west corner of this territory, the Longfellow Mines and others producing large amounts of metal at present.

To-day I have to report of the re-discovery of the mines from which the Aztec nation derived their copper, of which the Spaniards found such large quantities in their use. With the primitive knowledge in metallurgical matters possessed by an Indian nation, it is a conclusion easily arrived at that they must have had at their disposal a copper ore surpassing in good qualities, favouring its reduction into metallic copper in a primitive mode of smelting all ores at present treated here or elsewhere; and thus it has been. In vain would we seek all over the ore bins in Swansea, where all copper ores are represented at present mined on this globe, for a piece of "melanconite" and oxide of copper, resembling very closely magnetic iron ore, but of a reddish tint and of softer kratsh. It is seldom found, and but little known. Nevertheless do existing facts prove that such has been the ore from which Mexico derived its copper until northern tribes drove the Aztecs south and forced them to abandon the mines, from which copper could be produced with unsurpassable facility? A Mexican platero (silversmith) living at Nacimiento, in this territory, sent to me a piece of ore and a piece of copper, with the request to come and see what he had to show. So I went. The platero I found to live in an adobe hut of the poorest description, his stock in trade consisting of tools not worth \$5, amongst which self-constructed bellows, resembling in size and structure a hand-draw harmonica. Glad to see me, but shivering from cold in garments barely able to cover his body, while about an inch of snow had fallen in the previous night, and now was melting before the rising sun. He at once took a fragment of Indian pottery, put a piece of ore on it, and the fragment with the ore into his diminutive forge, using charcoal fresh from the wood burning on the open hearth, serving to heat the hut. After blowing for a few minutes he withdrew the fragment of Indian pottery from the forge, cooled it, and showed a thin crust of slag, and thereunder a sound copper button, as well done as the best I ever had from crucible assays. The experiment was repeated with pieces of ore of more or less purity with almost uniform results.

In driving up to Nacimiento I had noticed three tower ruins at short distances one from the other. They were said to be remnants of fortifications by which a nation formerly occupying the valley of the Rio Puerco had defended their homes against the wild, glaucous Navajoes, an Indian nation formidable to all others until subdued by the United States, and now living peaceably on a reservation in the north-west of New Mexico. On examination these pretended fortifications proved to be surrounded by copper slag, to contain unmistakable evidence of their former use as copper furnaces, and I remained to see the ore as "rock in place," in order to judge whether what for the Aztecs had been of so important value was of practical value still to-day.

At Bernalillo, when entering on my expedition, I had crossed the Rio Grande, and proceeded in a north-westerly direction, ascending the valley of the Santa Ana river, a tributary from the west, like the Rio Puerco, to the Rio Grande. Following upward the course of the Santa Ana river, passing by some Indian pueblos, Santa Ana and Fria, I reached the mouth of the Canon de Temez, so justly celebrated for its hot springs as well as romantic beauty. The night had to be passed in camp, during which the horses managed to run away and back half-way home. When they were recaptured we my Mexican companion and I proceeded on our journey, flanking the south point of the Temez Mountains, they being a spur of the Nacimiento Mountains, so as to reach their west side, or the upper valley of the Rio Puerco. Ascending this valley ample opportunity is afforded to judge of the geological features of the country. On both sides of the valley, being a broad canon, are exposed the bold and nearly vertically cut horizontal strata of the cretaceous coal formation. Coal veins are visible along these bluffs, and one I cut into showed 42 in. of clean anthracitic lignite of excellent quality, and free of iron pyrites, resembling the anthracitic coal from the Wealden formation in North Germany. It is in all probability fit for metallurgical purposes. The Rio Puerco valley is wide up to its very sources (Nacimiento), and contains excellent agricultural and grazing land. When arrived at Nacimiento, and after experimenting with the ore, we started up a canon (valley) towards the east into the Nacimiento Mountains. Soon the horizontal strata were left behind, and ledges of rock, looking like upset mammoth tables, presented themselves. The softer ones having given way to atmospheric influences, longitudinal valleys were left parallel with the axis of the Cordillera de Nacimiento (north and south). The water-courses were full of blocks of granite. Thus proceeding for several miles up the Canon del Yeso, I at last stood before an enormous cliff of sandrock, bare and exposed to a height of 1000 ft. and more in places, a stratum standing on an incline of 40° dipping west, locally cut and broken by narrow cross valleys. These cross valleys showed the sandrock to be underlain by conglomerate, enclosing round worn pebbles, evidently the former bed of a river, now uplifted high into the air, and to a degree of 40. Sandrock and conglomerate both showed petrefacts of parts and limbs of trees from the size of a finger to that of a log. Breaking loose some of these petrefacts they presented themselves as heavy pure copper ore, as the ore experimented upon, and with which the furnaces had been fed centuries ago.

The ledge called La Lista de la Campana, because there is a tradition that some Spaniards manufactured a church bell from metal taken from this ledge, proved to be thus exposed on the west side of five mountains—namely, the Cerro de la Canada de los Pinos, Cerro de San Miguel, Cerro de San Pablo, Cerro del Senorito, and Cerro de la Mina de Cobre.

The copper-bearing quality of the vein appeared uniform over the cliff exposed, and by estimation to amount to 4 per cent. of the rock as ore, not as copper. Though poor in its parts, the stratum proved of immense value on account of being bare and exposed in great quantities, and the low cost at which the ore can be produced, as well as on account of the abnormal facility with which it smelts.

The first location under the law of the United States, according to one location only on any one vein to one citizen, was made for the Mexican platero, and some Mexican settlers claiming a right in the land, locations were made for them, they quit claiming their pretended rights to the consolidated claim owners; then I located for myself and friends altogether 14 claims, or 21,000 ft. longitudinal on the Lista de la Campana. Thus I am a party to the concern, which I mention for the benefit of those who imagine that opinion and judgment are influenced in our profession by individual interests. I think that with the majority it is not so, at least I ought not to be so. If in this country we become unfit for reporting by being an interested party, we must quit reporting, because we usually receive the pay for all our trouble in an interest in a concern. In breaking the rock containing the ore about two-thirds of poor rock may be thrown over the dump, and the last third will have to be dressed in jigs, &c. The clean ore, or concentrates, will assay about 40 per cent. in copper, hand-pieces assaying from 24½ per cent. to 46½ per cent., but the richer being the more frequent ore. I calculated material for about 120,000 tons of copper being exposed, and cost of production to be per ton of copper laid down at New York \$120 to \$150, or 24½ to 30½.

All the owners of the now Consolidated Nacimiento Copper Mines would be well pleased to part with a large interest in the mines for working capital to somebody who would run the concern for himself and them, and as railroads and immigration are at present crowding into New Mexico some speculative Americans will soon take them in hand. Of late sundry of the mines formerly described by me in your columns have changed hands—some at tenfold the prices for which at the time they could be bought. Of old work on the Lista de la Campana there is but one quarry found as yet, in which, besides the ore above described being the lignitic brownish-red melacruite, a gash-vein of 18 inches solid copper ore of 24½ per cent. (resembling magnetic iron ore) occurs. Silicate of copper is also frequent in the same rock, but of less value.

F. M. F. CAZIN,  
Mining and Civil Engineer.

Santa Fe, New Mexico, Dec. 16.

#### MINING IN NORTH AMERICA.

SIR,—As I am in America, and have the pleasure of reading your valuable Journal from my own native land, I would ask space for these few lines. I have been in this country 25 years, and do not hesitate to say that there is a better chance for making money in mining in this country than in England, and wish to call the attention of my countrymen to a run of copper mines in Carroll county, Maryland, extending from the Western Maryland Railway on the north to the Baltimore and Ohio on the south, in a north-east and south-west direction, for a distance of about 12 miles. One of these—the Mineral Hill—I believe to be a No. 1 mine, and a safe investment for any company that wishes to invest in copper mining. There has been a great deal of good copper taken out of this mine of from 15 to 25 per cent., but a few years since the engine-shaft (which was not properly located) caved in. That, with the bad times and low price of copper, caused the company to stop operations below the adit. In cross-cutting from the adit another big, strong, well defined vein has been discovered, intermixed all through with copper, and having every indication of making a big bunch of ore below, and is believed to be the main vein of the mine. A few thousand dollars would no doubt make it a good paying mine, if properly spent. There is a good engine and crusher on the mine, also blacksmiths' shop, carpenters' shop, stables, &c., and several good dwelling houses, all in good repair. The losses of ignorant stockholders by the trickery of a few unprincipled speculators, together with the low price of copper, has for the present extinguished all enterprises in that line here, but we have unquestionably a fine field for the profitable employment of capital. The climate is delightful, and good farming land cheap. We have quite a little settlement of English miners, who have bought small farms out of their earnings in this region, and of course want to see business lively once more.

WM. POOLEY.

Freedom, Carroll county, Maryland, Jan. 1.

#### FLAGSTAFF SILVER MINING COMPANY OF UTAH.

SIR,—I observe in last week's Journal a paragraph referring to this company, from which it appears that Mr. Pearson is again venturing his "proposals," but this time he comes more boldly to the front, and states that he "is now in a position to give a clean title to the whole of the locations on the lode which have been offered for sale." This statement is the more extraordinary, as it does not appear that he has any authority in the premises; but if he has, it is satisfactory to know that a clear title can be given. He evidently does not know (or pretends not to do so) what, or even whether any, negotiations are in progress for the purchase of the various mining claims on the Flagstaff lode, for he adds that "no negotiations are at present open in this country." This must, of course, be understood to mean in so far as he is personally concerned.

If he is only "now" in a position, what has been his relation to the matter during the last eight or nine months, in which interval he has so repeatedly assured your readers that the whole affair was in his own hand? Further comment is unnecessary.

6, Great Winchester-street, Jan. 8.

A. A. DE METZ,

#### ALL ABOUT TIN—AN ENQUIRY.

SIR,—It is necessary that you find your tin before you can dress it, consequently, in a discussion under the above heading, some may think that how to find the tin should fall first in order. But there are at the present time pretty good reasons why tin dressing should first come under consideration. However much the mining knowledge of the mine agents of Cornwall may have been undervalued in former times, there cannot have been much question lately about their ability for finding the tin, and knowing it when they have got it. The best and surest mode of dressing and saving it in the dressing is quite another matter. There are always a number of people outside who think the miners are as ignorant as themselves on these matters, but miners are not alone here. It is the case in every walk in life, and with every profession. Quite a number of people can always tell the Prime Minister of this country what he ought to do. If a general is commanding in the field, there are thousands at home in and out of every cobbler's shop who think themselves far better able to command an army. The Church, notwithstanding the learning and devotion of so many of her ministers, comes in for her full share of criticism and even abuse. A poor parson—I think I see him now—has been giving away his money to supply coals to the poor of his parish, and a number of gentlemen (?) have been censuring him for not having given the management to themselves, although they had not contributed anything. A man who is colour blind thinks that all the world but him may be colour blind. A madman thinks he is the only sane individual in the universe. An ignorant man cannot see another man's wisdom, and thinks that that is the ignorance which himself fails to understand. We quite often see that those especially trained to any profession are totally discredited with any special knowledge of that profession which they have made their daily study, so that miners are not worse off than other people in that respect. With them, too, there are chances of turning the tables when one makes a good hit. If a mine captain strikes "ile," he is forthwith dubbed a knight—only, however, to have his spurs hacked off again the first moment the spring dries up. While in "luck" he is credited with some special knowledge of his profession, but let Dame Fortune turn her back on him, and he is again in the rut of know-nothings, and every tinker knows better than he.

Leaving this digression, and turning our attention to the dressing of tin, we find, unfortunately, there are so many opinions among tin dressers as to which is the best method that the distrust of outsiders is not only quite understandable, but we cannot see how it should be otherwise. These different opinions, however, are no more than the necessary outcome of each single and silent worker making an especial study of his own surroundings, of the particular class of ore he is called upon to deal with, the especial composition he has to get rid of in preparing the dressed ore for market, the continuity or otherwise of his supply, and sometimes of the especial adaptability or otherwise of the people he has above, below, and about him to appreciate him and assist him in his work.

Here we have entered upon the especial field of the Mining Institute of Cornwall, not with any desire, however, to detract from its usefulness, but rather to promote it if any small effort of mine can promote that usefulness. Here is a wide and important work before all these different opinions, to sift, classify, embody, and select, and eventually to reduce to the certainties of science that vast amount of empirical knowledge and scattered information now influencing the action of so many who are working singly and silently, doing the best they can according to their own individual practice. This paper has been headed, All about Tin, but it is not likely that I shall write all about tin, and, therefore, is added, An Enquiry. Although I have had some experience in this matter, it is very possible the enquiry may far exceed the information given, and if the information elicited shall equally extend with the enquiry, my paper will not have been written in vain. We find with tin dressers that one will jig, and another will buddle, one will use frames, and another will pull them out, one will classify and assort his pulverised ore, and another will stamp it down pell-mell into a pit, one will get the tin through the stamps as quickly as possible, while another will so limit the power of discharge as to reduce most of his tin into slimes. If I show, as I

shall endeavour to do, that all these different courses are sometimes adopted with very good reason, I must show at the same time that to persist under all circumstances in any one of these, while sometimes right, would often be decidedly wrong, consequently that experience of one particular class of ore does not constitute a tin dresser.

In dressing tin ores, we have not to deal with one particular ore; if we had our task would be easy indeed. We have to deal with a very great variety of combinations, and I may say with an infinite variety of proportions. To enumerate a few of these varieties and proportions will be sufficient for our present purpose. First, we have the richest and purest tinstone, varying, it may be, from 20 to 80 or 90 per cent. and sometimes more of black tin in the stone, the little waste or gangue with it being only quartz, felspar, slate, chlorite, or such as is easily got rid of; even this varies considerably, being sometimes in large crystals, and at other times compact, sometimes friable, and at other times extremely hard and tenacious. Then we find a mixture of rich tin in small branches, with a very large admixture of granite rock—sometimes slate rock, and some of the branches containing iron instead of tin. Then we have a mixture of tin ore, tungstate of iron, blende, iron pyrites, arsenical ditto, and copper pyrites, and a few other things, sometimes a mixture of one or more of those ingredients and magnetic iron. Now, when we say that the proportion of black tin in these mixtures may vary from 1 to 50 per cent., and the same with all the other things, it is tolerably clear that we have no light thing to handle here; this, too, will show that there is some good reason for different modes of treatment.

Some of our leading tin dressers hold that running all the pulverised ore straight from the stamp coffer into the round buddle is the best and most economical way of dealing with it. They say you thus get the bulk of the tin at once into small compass, avoiding much loss of fine tin in the slimes, which would arise in every other way. There is no doubt that in dealing with all rich ores this reasoning is especially sound. First, we have rich tinstone passing through the stamps, and whatever care may be taken in the stamping, some of the richest of the tin has lain in the bottom of the coffer longer than necessary for its sufficient pulverisation, and it is, therefore, reduced to slime tin. Now, there is one special conservative quality tin possesses when reduced to fine powder in the wet way, which immediately comes into play in favour of this direct buddling. It is the extreme tenacity with which, once concentrated in a body, every grain of tin, however small, sticks to its nearest neighbouring grain. I do not know if my scientific friends will allow me the term here of electric attraction; it being the attraction of like to like, positive attraction might be the better term. But every man who has had to deal with tin ore, either on the dressing-floor or as an assayer of black tin, knows perfectly well that it possesses this characteristic in a marked manner, and that if he has not learnt to take full advantage of it he has not yet learnt his lesson. Once you have allowed the body of ore to be broken and disseminated, either for classification or for any other purpose, this conservative power is lost, the water regains the power of action on each particle of tin separately through every process, and that power of positive attraction cannot again come into play until there is again a concentration. While this has been going on much of the fine tin has escaped into the slimes, whence if you are not wide awake it has slipped through your hands altogether, and gone down to the river men. Where this direct buddling is adopted, and after the crop is taken out a perfect classification of the remainder, the dressing should be completed with a minimum loss, although even then the slimes have to be submitted to very careful treatment, and will probably pay for treatment further than it is generally pursued, provided you have clear water to do it with. At this point there cannot be any excuse for making much mistake. The river men have certainly shown how to treat very poor stuff with success; and instead of arguing as some do, which is even here the best, the frame or the buddle, there will be found greater advantage in taking a run to see what these river men are doing.

Another tin dresser will stamp in "strips"—i.e., long launder-shaped troughs—and commence his classification from the stamps grate; this may probably be the most advantageous course under many conditions—for instance, where the tinstone is very foul, and the percentage or proportion contained therein low. He has thus the concentration of the tin in the "savers" or top part of the strips, and this, freed considerably from much of the foul ingredients, can be separately worked in the buddle with advantage. Here is a broad field for the successful introduction of automatic machinery, and I am satisfied that none will be more thankful for such machinery than the people having the management of such ore. In some of the granite districts the percentage of tin in the stone is rather low and free from any corrupting mineral, the gangue being sometimes schorlaceous rock, quartz, felspar, and such things easily got rid of. This stamps freely, and being turned into strips, the tin mostly remains towards the head of the strip, and the lower end may be thrown entirely away without much loss. Under these circumstances a few times buddling of the upper part of the strips, and a few tossings in the sieves, constitute almost the entire dressing. The tin in the after slimes being scarcely worth following, the number of frames is limited, and are principally required for the fine skimpings from the sieves. It is clear there can be no very important Red River here. A tin dresser from this district ignores the difficulty altogether, and looks upon his harder-worked brother of the slime pit as being a very careless, ignorant, and lazy lout.

One thing that must not be lost sight of is the fact that in all stamping there is much wear and tear of the machinery, and that the debris of the stamp heads and other wearing parts passes for the most part through the stamp grates, mixing with the pulverised ore to be dressed, and becoming the most troublesome "waste" to be got rid of. This, in the stamping of hard coarse quality tinstone, becomes of considerable importance, the proportion then to the quantity of tin in the ore being considerable; it is acted on by the oxygen of the atmosphere from the first moment it leaves the stamps grates, consequently much of it passes down the river with the first tailings, but the heavier portions stick to the tin long, and passes with the "widts" into the calciner, where it is rapidly attacked by the sulphuric and arsenical pyrites, and much of it further oxidised by the large volumes of atmospheric air admitted, and yet after all this a portion of it remains to give more trouble in the dressing-house, and to increase that large heap of burning-house leavings which have to be further pulverised. It will thus appear that a hard and fast rule can scarcely be applicable under all circumstances. Considerable variations will always obtain from the causes herein pointed out, and from causes not, perhaps, pointed out. Each man who has a tin mine under his control must, to dress his ore successfully, make that ore, and the surrounding circumstances his particular study. Fighting as some do for buddles versus strips, buddles versus frames, everything versus jiggers, &c., must, unless the class of ore be first described, be a fight in the dark, and lead to no result. On a well-ordered dressing-floor most of these things will be found in their proper place, and the best adapted to the work each has to accomplish. And then much depends on the way the machine whether buddle or frame, or anything else, is constructed. Frames have been found to fail in performing the work required from having been constructed of the wrong kind of wood. After all this, the greater part will depend on the kind of brains in the head of the man having the control of the manipulation.

Much has been talked and written of late about jiggers. Now, I do not suppose that jiggers will become universal on all tin dressing-floors, but I have seen a mine, and I fancy more than one, where good jiggers and jiggling would have been the best machines and the best principle to have adopted, but these mines have been exceptional ones, and are not every day before us.

It was suggested in the paper read by Dr. Foster, before the Cornish Mining Institute the other day, that a commission, consisting of a chemist, a mineralogist, a metallurgist, and an engineer, should be constituted, to take into consideration this matter of tin dressing and loss of tin in dressing. We are not going in these days to refuse the aid of science, knowing as we do that all science is based on practical experiment and on practical experience, and yet this commission appeared rather ponderous, and the meeting decided properly to let this matter stand over for awhile. It is, after all, work which falls within the scope of the field of operations the Mining Institute has before it, and all the required special knowledge for such a commission may be found among the members of that Institute. The

chemist may be a tin dresser, and so may be the mineralogist, the metallurgist, and the engineer. The best machine I have ever seen for dressing tin was introduced by a machinist, Mr. Edward Borlase, who lays no claim to being a scientific man, and yet he is so, for he has most scientifically applied his practical knowledge. The machine he constructed for me at Pedn-an-drea is the most perfect piece of mechanism adapted to the dressing of the most difficult work on the floors that I have ever seen work; but then Borlase was a tinner long before he made that machine, and as good a tinner as I ever knew.

The Red River people have introduced some good notions adapted to the saving the small percentage of tin contained in all that river mud, and yet we may doubt their capability of saving without loss the rich stuff produced in some of our mines. It has been stated that as the tailings and slimes in the Red River contain but 1 per cent. of tin that is an insignificant quantity. This surely is an erroneous calculation. I opine that the people on the Red River would all make good fortunes if they had anything approaching that percentage? What is about the average percentage of the tinstone produced from the mines? Probably something under 2½ per cent. I believe that 15 or 20 years ago it was nearer 1½ per cent. Now 1 per cent. left in the tailings would constitute so large a proportion of the tin that it would be preposterous. It was stated at the recent meeting that 20,000 tons of stuff was sent down the Red River monthly, containing 80 tons of tin. This would give a decimal of .44-10ths of 1 per cent. as loss, which is still a considerable proportion of the tin originally contained, and the probabilities are that much more than 20,000 per month may be sent down.

I find that I have already occupied sufficient space without having written all about tin. I propose, by your leave, returning to the same subject on a future occasion, and shall not likely then write all about tin. I have, no doubt, however, that enough has been written already to call forth remarks that shall show some attention has been and is still being paid to the dressing of tin, and that some at least of the tin-dressers know what they are about.

W. TREGAY.

Redruth, Jan. 1.

#### LEAD MINING IN DURHAM.

SIR,—It is gratifying to notice the increased activity in the lead-producing mines of this important district. Where only a few months ago tributaries could not raise lead ore much cheaper than the market value, now some 5l. or 6l. profit per ton may be realised. This of course cannot fail to stimulate mining in a very marked degree, more especially in this district, which yields lead ore so abundantly and cheaply. There is no other lead producing district in the country can compete with this when we feel inclined to put forth our strength in the development of our unlimited resources. I say unlimited from the fact that though some of our mines have been very successfully wrought for centuries, we are in a measure almost in our infancy. As our lodes produce ore in large and remunerative quantities almost from the surface, and we have upwards of 400 fms. in depth of lead-producing strata, our fame has evidently gone abroad, as I perceive in the *Mining Journal* of last Saturday that the Rookhope Lead Mines are to be vigorously worked under the title of the Northern Mining Company, the offices being in London. I am pleased to see that the prospects are so good at the Derwent Lead Mines, both of which are situated in the very heart of this important mining field, and it seems to me cannot fail to be very profitable to the shareholders.

JUSTICIA.

Newcastle-on-Tyne, Jan. 6.

#### SOUTH WHEEL FRANCES.

SIR,—I am pleased to inform you and the shareholders generally that Pascoe's shaft is very much improved since last reported; the lode presents a very favourable appearance, and is now worth 50l. per fathom. The 215 west is worth 25l. per fathom, and a rise in the back of this level is worth 25l. per fathom. The same level east is worth 12l. per fathom. There is no alteration in any other part of the mine since last reported. The stopes are producing the usual supplies of tin ore, and the new surface work is being urged on.

Redruth, Jan. 6.

A. T. JAMES.

#### INVESTMENTS IN MINES.

SIR,—A few words of advice to some of your readers may not be out of place, especially to those who contemplate embarking their little capital in the hope of speedily doubling or quadrupling the amount. Many new companies may be launched with high sounding names—the Great Cornwall this or the Great Devon that. Regard them not unless you know the parties are men of irreproachable character, unless it is clearly stated what capital is in hand, and that there is no promotion money, but that every penny subscribed shall be spent in developing the property or properties. Let not the inexperienced condemn mines whose shares are at a premium. The genuinely good mine is brought out on the market by those who have found money to purchase a good property, or who have with their own capital brought the mine to actual or the eve of success. To deary premiums on such properties would be downright folly, or to avoid reconstructed mines upon which large amounts have been expended, as, for instance, North Penstruthal, where the mine is fully furnished with excellent machinery, a large amount of underground work done—a shaft sinking below the 100 in a large lode, which is daily becoming more settled under the large elvan, and promises great success. Cross-cuts are being driven both north and south to cut numerous other lodes, any one of which may render the property exceedingly profitable to the investor. Loss is reduced here to a minimum, while the gain may be a thousandfold.

Adjoining this mine is the celebrated old Penstruthal—now called South Penstruthal. All mining men of the last generation have heard of the splendid copper ore here raised, consisting largely of black and grey ores. This mine was abandoned at the last working through the unwillingness and inability of the shareholders to subscribe a further 2000l. to develop the mine. A beautiful lode of the most promising character was here left in the bottom of Hodge's shaft. Here is the large lode of the district untried below the 130 fm. level, at its deepest point, and at others below the 70 fm. level. To the north and south of this lode rich tin lodes are known to exist, one of which has yielded tin of 60 per cent. produce, and the other has been reported worth over 70l. per fathom. These lodes can all be seen by cross-cutting from the deep adit—50 or 60 fathoms from surface. Here, then, the public have the opportunity of possessing an interest without premium in what will in the opinion of all good miners become again exceedingly rich, and that at a small outlay.

If we refer to the mines which have been so eminently satisfactory to all shareholders the past year we must notice Wheal Pevor shares, which have more than doubled in value in 1879. Adjoining this mine is West Pevor, whose shares have advanced from 2l. to 9l. South Frances, West Basset, and West Frances shares have gratified their owners by not only increasing in money value but by exposing hidden riches which will last for many years. West Basset have advanced from 3l. or 4l. per share to about 14l. Wheal Basset is entering on the same road to success, which the year 1880 will probably see realised; supplied with the best plant and most modern appliances non-success lays beyond possibility. On the north of this range of mines are Carn Brea, which has improved very much in the value of its shares. East Pools were 9l. to 10l.; are now 22l., having returned a profit of 17s. 6d. per share on three months' working. Adjoining this property is Wheal Agar—now entered upon its self-sustaining state, and seeing that it possesses all the lodes of East Pool development now being vigorously carried on can only lead to great results. South Crofty Mine has also encouraged its shareholders by the discovery of a rich lode in the eastern part of the mine.

Of lead mines Cornwall possesses but few—West Chiverton, East Chiverton, and Herodsfoot. The latter was bought in the early part of the year and a new company formed, every penny subscribed going to the development of the mine, putting down new dressing machinery, sinking and rising for a new shaft, and, in short, putting the mine in a good state of working. In the bottom of the mine the lode is of a most masterly character—in fact, looks but the top of an enormous body of lead. The discovery of the lode at the 70 opens up a second and new mine, rich in lead and silver. This mine bids

fair to become the Cornish lead prize of the present year. Another lead mine in North Wales I would only name—Port Nigel. Let your readers enquire. Early profits and early dividends are plainly forthcoming. I must defer until another week my remarks on several mines.—*London, Jan. 7.* W. H.

#### CORNISH MINING.

SIR,—What I predicted some months ago of this industry have been verified, from the fact that since last August, taking 50 mines of the two counties, an advance in their market value of over a million sterling has taken place, and judging from the metal market statistics, improved trade, and important discoveries being made in some of the leading dividend and progressive mines, there is every prospect of a further great advance, but although the chances in a rising market are in favour of the speculator, it must not be forgotten that some mines dealt in are destitute of the elements essential to the production of mineral in quantities sufficient to give dividends. Among the great number dealt in such mines are purchased with equal avidity, while undertakings certain to be eventually successful are overlooked, discrimination between the two classes should be the guide of the *bona fide* investor. The dividend of 17s. 6d. per share, declared at the East Pool meeting on the 29th ult., places it at the head of dividend mines for the year 1879, having divided 12,600l., while South Frances have divided 10,000l., and Wheal Pevor, a young mine, 5000l.; the latter mine will show a profit at the next meeting nearly equal to the profits for all last year. Some 12 months ago I wrote strongly of the prospective merits of these mines; those who accepted the hint have no cause for regret. If the present price of tin continues (and the best authorities say it will go higher) during the ensuing year these dividends will increase 50 per cent., the discoveries warranting the assertion, and I venture to predict there are mines which may now be considered in embryo, having all the elements of success, and but little known, which the writer has recently seen selling at a market price below the value of the plant on them, before the expiration of 1880 will rank among the prizes of the lot, again rewarding those who take "time by the forelock."—*St. Day, Scourier, Cornwall, Jan. 7.* C. BAWDEN.

#### DYLIFFE MINE, AND NORTH WALES CORRESPONDENT.

SIR,—My reason for asking your North Wales Correspondent to name the lode and the company to which he referred in his former statement was because the mine has been worked by several companies, and contains several lodes—Dyliffe, Llechwedd-du, Esgair-galed, and one which for the present we designate the New lode. There have been extensive workings on the first named three, and at times have each been missed in course of working. The mention of Mr. Garside, in his last report, under whom, as he rightly surmises, it was my pleasure to serve on my first coming here, leads me to suppose that the lode referred to is Llechwedd-du, which at a point east of Bradford shaft is split in two, the north branch seeming to all appearance the strongest; driving was continued on it with disappointing results, and was ultimately stopped, the lower levels were allowed to fill with water, and remained so some years. We have, however, reopened and drained the mine down to the 125, and by sending out cross cuts south from the end of the 105 and 125 have found the main part of the lode containing good ore, which we are now stopping. Before concluding I wish to say a word or two about our New lode, so called. This lode is situated about 200 fathoms north of Dyliffe lode, and 50 fathoms south of Llechwedd-du lode, and is very similar in its bearings to them. It is peculiar, inasmuch that it underlies south, while all our other lodes underlie north, and on this account it has been left standing untouched for generations, being considered by former workers unworthy of a trial, because, as they used to say, it underlies wrong. About two years ago we commenced a winze on this lode, as a sort of experiment, which we sunk to a depth of about 14 fathoms, and from which we got large blocks of lead ore, the lode proving to be strong, well defined, and improving on going down. I am glad to say we shall soon be at work on it again, and quite expect that this, the rejected of our predecessors, will bring back to Dyliffe its old prosperity and renown. R. DEAN.

*Dyliffe, Jan. 7.*

#### CHEAP SHARES—KILLIFRETH.

SIR,—All mining shares are now enquired for more or less, but those in the principal ventures are being rapidly absorbed by investors and speculators alike, and have consequently a strong tendency upward. It is quite evident that now is the time to look after cheap shares—shares in promising and improving undertakings not yet in the Dividend List, but moving towards that desirable goal. I would to-day call attention to Killifreth shares, which I believe have a great future before them; this is, in fact, the general opinion of the market. Since your announcement in December that all forfeited shares are now disposed of, so that the mine again consists of 6000 parts, no shares to speak of have been offered for sale. It would be extremely difficult to buy a larger number (say from 15s. to 17s.), and this shows that the holders do not care to sell at the present nominal prices, and that much higher quotations are confidently expected. I think that there is every prospect of such expectation being promptly realised, and would, therefore, advise those who want to buy not to tarry much longer, as they are then sure to miss their chance; but a few orders will raise the shares to 2l. and 3l. I understand that the mine never looked so well as at present, and with the actual prices of tin large tracts of ground will soon pay for working that had to be passed in times of depression. I also understand that steps are contemplated to obtain for the shares an official quotation.

*Jan. 8.*

A PERMANENT SHAREHOLDER.

#### MINING IN LLANARMON.

SIR,—On the Monday before Christmas Day I and an esteemed friend of mine started from Mold early in the forenoon for a day's out in the Llanarmon district, to make observations and notes as to the progress of mining in the neighbourhood. Obtaining the use of a trap, horse, and driver we started on our way at a nice pace, with a beautifully clear atmosphere, which made the journey pleasant all the day. Going up the Ruthin road we passed the Gwernymynydd Mining Company's offices, and a long stretch of land on one side the road reaching the greater length of the way to the Loggerheads, belonging to this company. My companion gave me some valuable information respecting this company, which I see by the reports in the Journal is fully borne out by the results of their working that portion of their property known as Vron Vovnog. We quickly passed the Loggerheads on the Llanarmon road, and on the left-hand side, nearly opposite the Cross Keys public-house, we noticed the entrance in the mountain side of the Nant Adder day level, at which I afterwards learnt men are now at work clearing out the debris in preparation for a vigorous working of the property. This property is destined ere long to play a most important part in the successful working of a very extensive tract of very valuable mineral ground. Passing on we soon arrived at our head-quarters, where we arranged for the day's comfort for man and beast. Having arranged some little private matters we were very soon in the company of one of principal mining engineers and agents of the district. We examined various properties, and discussed the *pros* and *cons* of many others in the Llanarmon district. Since I was there I have carefully thought over everything I saw and heard. In doing so my thoughts have led me to make a suggestion or two, which I think would be most conducive to the interests of everyone concerned—the mineral owners, the landowners, the farmers, the workmen of the district, and the outside public, who in future may take an interest in the development and working of the matter, which I am desirous of seeing carried out. My proposal or suggestion, then, is this—that the mineral owners of Nant Adder, Lady Ann, Bryn-y-Mwyn, Pant-y-Gulanod, Byrn Alyn, Lead Era, Old Westminster, and Bodidris Mines, and any other smaller plots on their lines should be joined together in one undertaking, with a capital (say) of 200,000l. or 250,000l., and worked as one company, under a name such as the United Westminster Mining Company.

I feel sure that there is sufficient talent, ability, and perseverance to accomplish such an undertaking, and if the at present disjointed properties could all be amalgamated under one able management I

am led to believe, both by my own observations and the remarks of able mining engineers, that this district would be one of the most famous for lead mining of any in the country. I feel sure that my friends will forgive me of any desire to do them wrong if I mention the names of gentlemen who are in every respect fully qualified to carry out such a scheme as is here indicated. They are the following—Capt. William Francis, of Northop; Capt. Ede, The Nant, Llanarmon; Mr. J. L. M. Fraser, of Wrexham; and Mr. R. Treddinick, of London, whose able articles I read with pleasure as they appear in the Journal.

I simply throw out the outline of the contemplated scheme as it suggests itself to me, and shall be glad to see the matter discussed in a friendly spirit by anyone interested in the further development of this district.

ENQUIRER.

#### PANT-Y-MWYN.

SIR,—Having thoroughly inspected and reported upon this valuable property in October, 1878, I felt interested in ascertaining what progress has since been made in developing the valuable discovery then proved to be a considerable extent, and, in passing, I called to make some enquiries. I have much pleasure in stating for the information of friends interested that subsequent workings have fully confirmed me in the views I then entertained of the great course of ore proving richer and more productive in the deeper eastern measures, the ore ground being 80 yards in length in the deepest level yet driven (130 yards), and I have every reason to believe a steady continuance of the improvement will take place as depth is attained. Every exertion is being made to facilitate the sinking of the eastern (Modlyn) shaft into this rich deposit, and 30 yards deeper it is calculated will attain this desirable object. Preparations are in progress for the pumping machinery required for an increased flow of water, when other runs can be followed down with great advantage for a continuously increasing yield of lead ore, whilst ultimately large appliances for pumping will be necessary, and the old mine worked in connection will undoubtedly establish this as one of the best mineral properties of the present age. No time should be lost or expense spared in sinking the Modlyn shaft with all speed, as herein lies the vital hopes of quick and remunerative returns, and a speedy transference of this property to the Dividend List of mines. All other portions of the workings are sufficiently laid open and proved to point to this work as the marked desideratum of future operations, and I shall be truly glad to hear the necessary machinery is at hand for the furtherance of this desired end. I find the yield is now about 25 tons monthly, which, considering the inconvenience of working, is a clear indication of what is likely to be forthcoming when the discovery is fairly opened out in depth, with a succession of levels for regular monthly yields and for future reserves. In twelve months I expect the shaft sunk into the main run, and levels sufficiently extended to return 100 tons monthly, and an increase may be expected, as circumstances may render it advisable—that is, provided all the necessary outlay is forthcoming to prosecute the mine with the utmost vigour.—*Northop, Jan. 7.* W. FRANCIS.

#### THE SCOTCH MINING SHARE MARKET—WEEKLY REPORT AND LIST OF PRICES.

During the past week the holidays have been ended, and business resumed more actively. Confidence continues to be felt in a general revival of trade in 1880, and consequently prices have had an upward tendency. The Board of Trade Returns, just issued, are very encouraging, and new life seems to have been infused into all our home industries. The money market, as usual at this time of the year, has gone to easier rates, which is also in favour of prices rising. Investors may have every confidence in making purchases at present unduly depressed prices in all sound mining and metal shares.

In shares of coal and iron companies there has been a decided improvement all round. Scott's Iron have advanced 4l. per share; Nant-y-Glo and Blaithwaite (A) 1l.; Boleckow, Vaughan (A), 15s.; Glasgow Port Washington (A and B), each 15s.; Fife Coal, 10s.; Monkland (pref.), 7s. 6d.; Marbella, 6s.; Chillington, 3s. 9d.; Omoa and Cleland, 3s.; Ebbw Vale, 2s. 6d.; Benhar and Monkland, each 6d. On the other hand, Lochore and Capella are 10s. lower. The pig-iron market has been very strong, both for raw and manufactured, this week. Warrants touched 70s. 3d., but have since gone easier on expectations that the colliers on strike would accept the new offers of the masters. However, any relapse should be the buyer's opportunity, as the construction of new railroads in America is likely to be renewed on an enormous scale. Makers continue very strong at advanced prices, and iron ore is becoming difficult to obtain.

Benhar have improved from 47s. to 48s. Darlington steel shares in request. Ashton Vale are at 7l. Andrew Knowles and Sons, 50s. dis. Boleckow, Vaughan, A 7½ to 7½; ditto, B, 4l. to 4½; ditto, stock, 12½ to 13½; and ditto, pref., 20 to 20½. Bilbao Iron, pref., 2s.; Cardiff and Swansea, 40s. to 50s.; Carnarvon, 9; Consett, 24; Charles Cammell and Company, 6 dis.; Chillington, 87s. 6d. to 92s. 6d.; Clyde, 77s. to 80s.; Darlington, 8 dis.; Ebbw Vale, 8½ to 9; Great Western, B, 75s.; Hamstead, 12½ dis.; John Bagnall and Sons, 32s. 6d.; John Brown and Company, 10½ dis.; Marbella, 43s. 6d. to 55s.; Monkland, 66s. 6d. to 69s.; ditto, pref., 7l. 3s. 9d. to 7l. 12s. 6d.; Muntz's Metal, 15½; Nerbudda, 30s. dis.; Mynydd, 22s. 6d. dis.; Newport Abercrombie, 6½; North Lonsdale, 90; Nant-y-Glo and Blaithwaite (A), 15s.; Omoa and Cleland, 22s. 6d. to 25s.; Parkgate Iron, 50s. to 70s. prem.; Pelsall, 52s. 4d. dis.; Rhymney, new, 7½; Scottish Australian, 37s. 6d. to 42s. 6d.; Steel Company of Canada, 3 to 5; Steel Company of Scotland, 11½ to 12½; Sandwell Park, 21½ to 21½; South Wales, 4 to 4½; Staveley, A, 24½ prem.; ditto, C, 85; Sheepbridge, new, 10; Shotts Iron, 80 to 83; South Leicestershire, 10; Thorpe's Gawber Hall, 55s. to 65s.; ditto, pref., 9½ to 10; Tredegar, B, 22½; Ulverston, 7; West Cumberland, 15; Worthington Malleable, 14.

In shares of foreign copper and lead companies Rio Tinto have advanced 7s. 6d. Panticulio and Tharsis, each 2s. 6d., and Canadian 8d., while Huntington are 6d. easier. Rio Tinto bonds are dealt in ex div. Tharsis have been very firm, at from 31 to 31½. Alamillos are at 35s.; Cape, 35; English and Australian, 32s. 6d.; Frontino, 5½; New Quibradra, 85s.; Panticulio, 6; Rio Tinto, 5 per cent., 92; Yorke Peninsula, 4s. to 5s.; ditto, pref., 18s. 9d. to 20s.

In shares of home mines prices have generally advanced, as many which were recently working at a loss are now making good profits. Tin shares have been very strong, on rise of 3d. in tin standards. At Dolcoath meeting, on Jan. 12, it is expected all the debts will be cleared off, and 14. per share dividend declared. The South Condurow pays a dividend of 15s. per share, and is, therefore, good to buy. Wheal Pevor are also cheap, as there are only 3000 of them, and at the next meeting a dividend of 10s. per share is expected. The meetings of Wheal Grenville and Wheal Uny made calls of 5s. per share. The payment by the Van of 10s. per share dividend, as against 5s. per share at this time last year, has also inspired confidence. The Frongoch will sell 100 tons of blende, and Red Rock 40 tons of lead, next week. Glasgow Caradon have been very firm at 7s. 6d. and 78s. 6d. dis. Boleckow, Vaughan, A, 15s.; Boleckow, Vaughan, B, 15s.; Boleckow, Vaughan, C, 15s.; Boleckow, Vaughan, D, 15s.; Boleckow, Vaughan, E, 15s.; Boleckow, Vaughan, F, 15s.; Boleckow, Vaughan, G, 15s.; Boleckow, Vaughan, H, 15s.; Boleckow, Vaughan, I, 15s.; Boleckow, Vaughan, J, 15s.; Boleckow, Vaughan, K, 15s.; Boleckow, Vaughan, L, 15s.; Boleckow, Vaughan, M, 15s.; Boleckow, Vaughan, N, 15s.; Boleckow, Vaughan, O, 15s.; Boleckow, Vaughan, P, 15s.; Boleckow, Vaughan, Q, 15s.; Boleckow, Vaughan, R, 15s.; Boleckow, Vaughan, S, 15s.; Boleckow, Vaughan, T, 15s.; Boleckow, Vaughan, U, 15s.; Boleckow, Vaughan, V, 15s.; Boleckow, Vaughan, W, 15s.; Boleckow, Vaughan, X, 15s.; Boleckow, Vaughan, Y, 15s.; Boleckow, Vaughan, Z, 15s.

In shares of gold and silver mines there has been more business doing. Richmonds are 2s. 6d. higher, this week's run being 555,000. The price has varied from 10½ to 10½, and 10½ to 11 ex div. A good business also done in Flagstaff shares and debentures. More favourable advices from the mines have also directed attention to Almaden and Don Pedro at better prices. The Pastora United gold returns for December have been 363 ozs., which is in excess of the returns for the corresponding month in the previous two years. Australasian Mines, 3s. 9d. to 5s. Chontales, 5s. to 10s. Colorado, 33s. 9d. Exchequer, 5s. to 7s. 6d. Eberhardt, 60s. Emma, 7s. 6d. to 10s. Frontino, 5s. L. L. L., 3s. 9d. to 6s. 3d. Javali, 5s. to 7s. 6d. London and California, 13s. 9d. Mineral Point, 30s. to 40s. New Zealand Kapanga, 12s. 6d. Port Phillip, 8s. 6d. to 9s. 6d. Pitangui, 10s. Rossa Grande, 3s. 6d. Ruby, 5½. South Aurora, 7s. 6d. to 8s. 9d. Sierra Buttes, 35s. St. John del Rey, 270. United Mexican, 57s. 6d. to 6s. 3d. West Pevor, 9s. to 9½. West Beest, 14. West Frances, 13. West Chilton, 1½. West Pateley, 2½. Wye Valley, ½. Wheal Comford, ½. Wheal Bassett, 3. Wheal Crestor, 8½. Wheal Agar, 6½. Wheal Jane, 82s. 6d.; Wheal Kitty, 55s.

The following calculations show the yield per cent. on money invested at present prices in the shares named, based upon the last average yearly dividends being maintained:—In shares of coal and iron companies Arncliffe would yield 6½; Boleckow, Vaughan (stock), 3½; Cairntrable, 10½; Muntz's Metal, 6½; Scottish Australian, 8½; and Steel Company of Scotland, 4. In shares of oil companies Dalmeny would yield 4½; Broxburn, 4½; Oakbank, 9½; ditto, new, 10; Uphall, 5½; and Young's Paraffin, 8. Tharsis Sulphur and Copper would pay 4½, and the new shares 4½. Among miscellaneous investments may be mentioned:—Cheshire Salt to yield 6½; Liverpool Rubber, 8½; Milner's Safe, 8½; Phospho-Guano, 3½; Price's Candle, 7; Scottish Wagon, 5½; ditto, new, 5½; United States Rolling Stock, 5; Val de Travers Asphalt, 7½. The following are also the highest and lowest prices touched in recent years by some other shares:—

Birmingham Wagon, 12½ in 1879 and 23 in 1877; Gloucester Wagon, 4½ in 1879 and 17½ in 1878; Metropolitan, 5s. prem. in 1879 and 5½ prem. in 1875; Midland, 7 in 1879 and 20½ in 1875; Railway Carriage, 60s. last year, and 13½ in 1876; Chillington Iron touched 38s. 9d. last year and 6½ in 1875; Muntz's Metal, 180s. prem. last year and 5½ prem. in 1875; Pelsall, 11 dis. last year, and 2½ dis. in same year; Sandwell Park Colliery, 12 in 1878 and 39½ in 1875; Valje Travers Paving, 60s. in 1871 and 5½ in 1878.

**NORTH MOLTON MINING COMPANY (Limited).**—In the very much altered condition of mining affairs this property will be a good speculation, and the 17. full-paid shares at 15s. should have a considerable rise. The present prospects of iron are quite sufficient to ensure success. The company's iron ore is again becoming saleable. The capital wanted is but small, and quite inconsiderable in comparison with the value of the property, and no doubt it will very soon be fairly started. It will do well, and result satisfactorily to all interested.

Capital.	Dividends.	Description of shares.	Last price.
Per share.	Rate per cent.		
£10	4	Arncliffe Coal (Limited) .....	4½
10	4	Benhar Coal (Limited) .....	4½
100	60	Bolckow, Vaughan, and Co. (Lim.) .....	79½
10	10	Cairntrable Gas Coal (Limited) .....	8
10	4s. 1	Chillington Iron (Limited) .....	92s. 6d.
23	20	Clyde Coal (Limited) .....	78s. 6d.
10	10	Ebbw Vale Steel, Iron, and Coal (Lim.) .....	10
10	8	Fife Coal (Limited) .....	5½
10	10	Flemington Coal (Limited) .....	97s. 6d.
10	10	Glas. Port Washington Iron & Coal (L.B.) .....	97s. 6d.
10	10	Ditto, A .....	97s. 6d.
10	10	Lochore and Capella (Limited) .....	10s.
10	10	Marbella Iron Ore (Limited) .....	54s.
10	10	Monkland Iron and Coal (Limited) .....	67s.
10	10	Ditto, Guaranteed Preference .....	7½
100	100	Nant-y-Glo & Blaithwaite Ironworks pref. (L.) .....	24s.
6	6	Omoa & Cleland Iron & Coal (L. & Red.) .....	40s.
1	1	Scottish Australian Mining (Lim.) .....	20s.
1	10s.	Ditto, New .....	30s.
Stock, 100	nil	Shotts Iron .....	83
10	8	Steel Company of Scotland (Lim.) .....	11½

Capital.	Dividends.	Description of shares.	Last price.
Per share.	Rate per cent.		
4	4	Canadian Copper and Sulphur (Lim.) .....	16s. 6d.
10	7	Cape Copper (Limited) .....	35
1	1	Glasgow Caradon Copper Mining (Lim.) .....	25s.
1	1	Ditto, New .....	19s.
10	10	Huntington Copper and Sulphur (Lim.) .....	43s. 6d.
4	4	Panticulio Copper (Limited) .....	5
10	10	Rio Tinto (Limited) .....	5
20	20	Ditto, 7 per cent. Mortgage Bonds .....	91
100	100	Do, 5 p. cent. Mor. Deb. (Sp. Con. Bils.) .....	19½
10	10	Tharsis Copper and Sulphur (Limited) .....	31½
10	7	Ditto, New .....	20½
1	1	Yorke Peninsula Mining (Limited) .....	5s.
1	1	Ditto, 15 per cent. Guaranteed Pref. .....	20s.

Capital.	Dividends.	Description of shares.	Last price.
Per share.	Rate per cent.		
1	1	Australasian Mines Investment (Lim.) .....	5s.
5	5	Richmond Mining (Limited) .....	10½

Capital.	Dividends.	Description of shares.	Last price.
Per share.	Rate per cent.		
10	8½	Broxburn Oil (Limited) .....	17½
10	7	Dalmeny Oil (Limited) .....	8½
1	1	Oakbank Oil (Limited) .....	49s. 3d.
1	5s.	Ditto .....	9s. 6d.
10	10	Uphall Mineral (Limited) .....	7½
10	10	Ditto, B Deferred .....	13½
10	8½	Young's Paraffin Light & Mineral Oil (L.) .....	13½

Capital.	Dividends.	Description of shares.	Last price.
Per share.	Rate per cent.		
50	25	London & Glasgow Engineering & Iron Shipbuilding (Limited) .....	25
7	7	Phospho Guano (Limited) .....	5½
10	10	Scottish Wagon (Limited) .....	9
10	4	Ditto, New .....	67s. 6d.

NOTE.—The above lists of mines and auxiliary associations are as full as can be ascertained, Scotch companies only being inserted, or those in which Scotch investors are interested. In the event of any being omitted, and parties desiring a quotation for them, and such information as can be ascertained from time to time, they will be inserted in these lists, they will be good enough to communicate the name of the company, with any other particulars as full as possible.

J. GRANT MACLEAN, Stock and Share Broker.

Post Office Buildings, Strling, Jan. 8.

#### PROVINCIAL STOCK AND SHARE MARKETS.

**MANCHESTER.**—Messrs. JOSEPH R. and W. P. BAINES, sharebrokers, Queen's Chambers, Market-street, Manchester, (Jan. 8) write:—The market here seems to have scarcely recovered completely from the influence of the holidays so far as actual business is concerned, although a moderate number of transactions is reported, but as regards alterations of prices the movement has certainly borne out the anticipation mentioned in our reports for the past week or two. The variations for the better are in great majority—there being very few instances of decline—and some are very decided. The tendency of prices generally is still upwards. Market strong with fair enquiry.

**BANKS** have not been dealt in to any great extent, but what business has been done has been at full prices. Manchester and Liverpool District Bank have advanced gradually, the latest price realised being the best, and the quotation to-day shows a rise since last week of ½. Bank of Bolton, A, are in some little demand, and though the quotation remains unaltered, buyers predominate at present figures, and no transactions are reported. National Provincial Bank (new), however, are quoted 1 lower, but no business done. In other concerns only solitary transactions are marked, and prices are without feature.

**INSURANCE** shares have not attracted much attention, Lancashire being the only one in which anything but desultory business has taken place; they close ½ in advance of last week's prices. Other movements are very few and slight.

**COAL, IRON, STEEL, AND MINING COMPANIES.**—It is in these classes that the chief feature to be noticed this week presents itself as with two exceptions—a fall of 1½ and ½ respectively on A. Knowles and Sons Coal and Staveley Coal, A—all the changes are for the better, and the advance has been in a greater or less degree general. The most noteworthy advances are Sheepbridge Coal and Iron, 5½; Parkgate Iron, 3½; Bilbao Iron Ore, 3½; Cammells, 2; Boleckow, A, fully paid, 1½; Earle's Shipbuilding, 1½; Tredegar Iron, A and B, 1 each; Ebbw Vale Steel, ¾; Nant-y-Glo and Blaithwaite (preference), 1; Boleckow, A, 60½ paid; 3; Darlington Iron, ¾; and John Brown and Patent Nut and Bolt, ¾ each. But demand continues for this class of security, the improvement in these trades being fully recognised as presenting profitable employment of money seeking investment.

**GAS AND WATER ANNUITIES AND CORPORATION STOCK.**—Prices fell fully up to best lately marked, which is only reasonable considering the return realised, and the security offered by these stocks. If trustees and others interested in sound investments direct their attention to Manchester Corporation Consolidated stock they will find that at present prices (104½) at which they have been done a few times lately, and once at 104½ they will yield 3s. 16s. 8d. per cent., and are preferable to the 4 per cent. debenture stocks of any of the leading railways, the security being undoubted, and it is easily and regularly negotiable. Except in this stock, no business is reported in these classes.

**COTTON SPINNING AND MANUFACTURING COMPANIES.**—Hardly so much business has been done in these classes during the past week as has lately been reported, but prices continue generally firm, and in some instances fresh advances are established. Demand still continues, but it is hardly so indiscriminate as was the case a few weeks back. Close prices still rule, and refusal to compromise on both sides has in some cases precluded business accruing. The position of these trades gives promise of fair profits being realised, and though in a great measure the improvement has been anticipated, realisation of expectations will doubtless strengthen this class of investment all round.

**MISCELLANEOUS.**—Very little has been done in miscellaneous shares, and movements are few and fractional. Rylands and Sons (Limited) are quoted ½ higher, having been done at par to-day. John Crossley and Sons have been done during the week at 104 and 10½; these shares having risen from 9½ in the past few weeks. A solitary transaction is reported in Liverpool Frame at 11½. RAILWAYS are generally improved in quotations. Switch stocks have been subject to fluctuations, but the opinion gaining credence that the Tay Bridge will be repaired, and a double line constructed, has given some hope to "Bulls" of North British, consequently a recovery from their lowest is to be noted. The Metropolitan dividend at 5 per cent. is announced, with 6000l. surplus and 35000l. to reserve; this appears to be a disappointment, but the South-Eastern 7½ per cent., with 15,000l. carried forward, against 8 per cent. for same period last year, has given an impetus to their deferred stock, which have risen nearly 1 per cent. The Great Northern traffic considerations, and their A stock has fallen ½ per cent. Others are good, particularly London and North Western, and prices are well supported; business, however, continues somewhat restricted. In American the sale of the Atlantic and Great Western Railroad to the re-organisation trustees has induced a better feeling in their issues, and a considerable advance is marked.

**NEWCASTLE-ON-TYNE STOCK EXCHANGE.**—Messrs. SPENCE and IRWIN, Grey-street (Jan. 8), write:—Bolckow, Vaughan, and Co.'s shares, owing to improved prospects in Cleveland districts, have had a good rise within the past few weeks, and as the demand for them continues good they will, doubtless, see a further advance. The prices to-day are 100½ paid shares, 132½ to 133½; 60½ paid, 19½ to 19½ prem. B., 30½, fully paid, 41½ to 41½; and Five per Cent. (pref.), 20 to 20½. Consol Iron still improving in price, and are now 16½ to 16½ prem. Consol Spanish ores are eagerly enquired for at present market quotations (30s. 6d. to 31s. 6d.), and as there is a great scarcity of sellers something more tempting may have to be bid in order to do business. Dealings in iron shares are again coming into favour, some investors thinking that by buying now and keeping them for one or two years a substantial profit may be realised as bidding freely for them at price since our last report, and as the buying is strong we look for a further rise. John Abbot and Co.'s shares, the great improvement in price has at last brought out a seller at 15 dis. Palmer's Shipbuilding and Iron shares continue the upward tendency, although a large number of them have changed hands; price now for A, 23 to 23½; and B, 7½ to 7½ dis.—Skern Iron: The recent scheme has been unanimously approved of by the shareholders, and it is not



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## THE SYDNEY INTERNATIONAL EXHIBITION.—No. V.

[FROM OUR SYDNEY CORRESPONDENT.]

The Foreign Courts, although for the most part containing exhibits less intimately connected with the subjects in which the readers of the *Mining Journal* are especially interested, include much that is worthy of mention, and there is no doubt much to be learned from them. This may safely be said of the rich collection of porcelain by Ernest Wablis, of Vienna. Amongst the most beautiful articles here exhibited is a very handsome tea-set, of a black ground, with most exquisite hand-painted flowers on each article—the rose, forget-me-not, pansy, lily of the valley, and other well-known children of Nature's garden being here represented. Inside the cups the pure white is bordered with a broad band of gold. Another set is of the same pattern and style, but with a white instead of a black ground. A dinner-set in blue, white, and gold is very elegant; the design is a very chaste border pattern, the blue and gold of which contrast charmingly with the white ground. A pair of remarkably handsome vases next claim attention. They are not unlike a pair we saw in the Dresden collection of the German Court. They are about 2 ft. in height. The ground is blue enamel, and the hand-painting is only on one side. The subjects of the pictures are mythical, from some of the wondrous fairyland tales with which Teutonic literature overflows. These vases have lids to them, a peculiarity not always observable in large articles of this description. Some flower-pots are rich and unique, of a black ground, with hand-painted flowers, and white and gold cut-out border. A flower-stand of these would enrich the finest drawing-room; and there are many others of equal beauty in white, pink, blue, and several neutral tints.

As a perfect specimen of ceramic ware may be mentioned a very peculiar occasional semi-etruscan cup and saucer. There is here a great originality of design; the saucer has a pyramidal centre on which the cup fits, preventing its sliding, as in modern sets, and thus avoiding the spilling of the tea. The pattern is a delicate wave of leaves on their stems, imitation of small branch, whilst here and there is a relieving touch of gold, very slight, but greatly heightening the artistic effect; this pattern on the purest white ground is simply charming. Next we find a very elegant pair of urns, with a rich Oriental pattern, in which all colours are so blended together that not one seems to predominate. The effect is splendid. Two tête-à-tête (tea) sets are exquisite, and have this peculiarity over the usual tête-à-tête sets for two, that there is a little one in; let us suppose that "baby" is to have its first tea with papa and mamma. Then the shape is peculiar; the saucer forms a large rose-leaf; the cup is the outer scale or shell of the rose; the sugar basin forms a complete rose, and it is ruthlessly cut across to allow the lid to be raised, and disclose the sugar within. The other articles of the two sets also assist in forming this unique cluster of roses. And still another peculiarity is that the cups are all completely gilt inside. The difference in the two sets is in colour; the one is in red, resting on the green leaves; the other a neutral yellow or primrose tint. Each set rests, of course, on a plateau of contrasting colours to set off the articles to advantage. Very elegant breakfast and tea-sets in great variety, and of chaste designs; and many other articles for domestic use, including some rare toilet sets, complete this very choice exhibit. The material is of a quality to match the patterns and designs; light and pure in tone without being brittle.

Belgium is admirably represented both in metal and in woollens. Mr. Charles de Lairesse, of Liège, has three stoves of very original design, all for the use of charcoal. One is a square stove of about 4 ft. in height, made of earthenware tiles and iron; the tiles are of various colours, and resemble the tessellated pavements now so much used in the halls, verandahs, and porticoes of our modern dwellings. The effect is very pretty, having, though plain, a very ornamental appearance. The only ornaments are the bright bronze rims and handles. This stove is intended either for a room or hall. Another very handsome one is of cast-iron, steel, and bronze very happily intermingled. This one, however, may be used with the handsome mantelpieces we described last week. Being quite closed in, there is no escape of either dust or cinders. The third stove of this group is for kitchen purposes, and is the handsomest of the three. It is of very ornamental cast-iron and steel; the entire front is ornamental fretwork; the cooking is of course done on the top, and there are doors to open with the usual places for keeping the plates warm and the viands hot; these, however, are artfully concealed by the ornamental work. When the cookery is finished, a handsome lid (on hinges) comes over the top, and any dulness from the use of the charcoal having been polished off by Sukey, the cooky, her kitchen will boast one of the handsomest ornaments ever previously seen in this department of any gentleman's household. This appendage to the kitchen is especially useful in a hot country, where the fire is required to be extinguished as soon as done with.

The Belgian tweeds and cloths shown are excellent. So important has it been considered in Belgium, that this branch of her industry shall be displayed at the International World Show (as our Teutonic neighbours call such exhibitions) that the Chamber of Commerce of Verviers has taken the matter in hand, and by its encouragement and support induced twelve of the principal wool manufacturers of that renowned city of fabrics to send hither for competition the choicest specimens from their looms. These are splendidly displayed to the greatest possible advantage, not done up in pieces as usual, but hanging in 4-yard lengths (sufficient for a suit), in eight handsome frames or stands, the tweeds lapping over each other, so that whilst the whole length is seen, there are about 8 in. of the width visible, sufficient to display the pattern. Each length has its price plainly marked. The collection contains black cloths of superfine quality, fancy cloths for overcoats, tweeds of every pattern and shade, cricketing flannels, crimean shirting, and a variety of other articles of the same species, the whole representing as fine and extensive a group of materials for clothing as is likely to be found anywhere. The quality is all first-class, and in spite of their superiority are very moderate in price. Some tweeds of a very heavy texture are well adapted for wear in our mountain districts, and in the colder climate of New Zealand. Some of the best pieces are very elegant. The exhibits of these same firms took the gold medals in Paris.

In connection with this exhibit of woollen manufactures there is a miniature machine for pressing the wool in its raw state, and filling the bales. The wool is put in at the top, and the open bale fastened firmly in an opening at the bottom. Revolving wheels above and below the wool press it closely together, and deprive it of all moisture. As the under grating and wheel are drawn away, the bag is open to receive the pressed wool, and the whole is delivered at the other end ready for fastening. We do not remember to have seen a machine of this kind previously used in this country in our wool stores; and we advise our wool-pressers to inspect it. The exhibitor of this machine is the widow Snoeck (relict of the inventor), of Verviers. Celestin Martin, also of Verviers, shows diagrams of the methods for counting, skinning, and cording the wool, so beautifully executed that they also were awarded a gold medal at the Paris Exhibition.

Passing through the German Court, we observed a series of articles that greatly attracted our attention, and we made copious notes. We took them to be handsomely ornamental table covers, and others we thought were gentlemen's travelling rugs. On describing the articles to those of our household learned in such matters, we discovered our error; they are—blankets! But what blankets! Texture so deliciously soft we have seldom seen or felt. There is no fear of their tickling, or rather scratching, the skin; they have the softness of lambs' wool or eider down; close and warm, they would infuse a gentle yet pleasing stimulant to the body. These blankets are from the little township of Osterode, in the Hartz Mountains, and are manufactured there by Greve and Uhl. We had scarcely imagined that the little township could have produced manufactures so excellent, though it is noted for its industrial pursuits and its mining. Here are blankets of every quality and description; the patterns are extraordinary, such as are never by any chance seen on blankets—hence, our first mistake. The colours (for they are all richly ornamented in this respect, and with the purest shades) are, of course, all fast; the patterns being woven into the groundwork. One has white roses on a pale blue ground, with white roses on a grey ground for the border. Another is composed of variegated stripes—one stripe is scarlet with a Grecian pattern in two shades of light brown; the

next stripe is white with green, blue, and red flocks on it; these two stripes alternate, and the whole blanket has a border of graduated greys. The entire square of another is studded with white roses on a pale grey ground; the reverse has a white ground covered with grey roses, the whole being surrounded with a deep handsome border of pink and grey. A very pretty one has blue, grey, and red stripes alternating, with a separate border pattern to each stripe. Besides these exquisite shades there are others less delicate in colour, and therefore better calculated for general use. Amongst them may be noticed one of very dark grey, mixed with red, another of moss, green and red, some of Scotch patterns, and some with red and white and others of blue and white stripes. The whole collection is remarkable for the length of the hair and the purity of the unmixed wool. Herr Keppel may well take the pride he does in showing these beautiful articles for domestic use, for which his firm (Schmedes, Erbsloh, and Co.) are agents, representing, as they do, Austrian as well as German houses.

Not far from the entrance to the Italian Court is an immense collection of lamps and gaseliers, exhibited by the factories of the Berlin Joint Stock Gas and Water Laying Company. Some of the chandeliers are of entirely new designs and patterns, and of rich material, on a rich gold-coloured bronze; some are imitations of antique bronzes; and others are in an entirely new-coloured metal that has never previously been seen in the colonies, this company being its only manufacturers, the invention being kept strictly secret by them. It is, of course, patented, but its imitation or discovery has not yet been effected. The colour is a beautiful leaden metallic blue; its greatest advantage is that it will neither tarnish nor corrode, always preserving its pretty bright colour by washing it like china. The composition is of copper and zinc. There are here some very large gaseliers, with numerous branches. One is peculiar in construction; the inner lamp slides down separately if more light is required on the table; the outer rim of the lamps, containing three brackets, very prettily ornamented, may be allowed to remain in its position and diffuse more light throughout the room, or may be also pulled down at pleasure. They are all fitted with Argand burners, chimneys, and globes, whilst most gas chandeliers are, as we know, without chimneys. All the lamps in this collection are very elegant both in design and workmanship, and are highly creditable to the manufacturer. Although very superior in every respect, they are very low in price; the entire collection is valued at only 200l.

Close by the side of this exhibit is a large oaken show-case, containing an assortment of some 50 dozen pairs of ladies' and gentlemen's kid gloves, of the finest material and best workmanship, from the well-known firm of Louis Graesser, of Zwickan, in Saxony. Few people are aware that a large portion of the so-called "French gloves," purchased in some of the leading shops here, are from the glove factories of Saxony. One special feature in this group is that the gloves are finished with a peculiar and entirely new dressing, which gives them a most piquante and attractive appearance. The preparation remains, however, at present, a secret with the inventor. The gloves are all hand-sown, and have from one to sixteen buttons, thus completely covering the arm, hiding defects or displaying beauties. In purchasing these gloves ladies and gentlemen should be careful to take one size smaller than that which they are accustomed to use; this will correspond with their usual number. The gloves are of every shade and size, and there will be no difficulty in making a selection of an excellent article.

## FOREIGN MINING AND METALLURGY.

The rapid advance in metallurgical products in Belgium and England has not been followed at quite the same rate in France, but a general upward movement is now anticipated. In the Nord the price of iron has been fixed at 8l. per ton.

As regards the Belgian iron trade, it may be stated that the Sclessin, Seraing, and Gredegnée works have issued circulars which give 8l. per ton as the basic price of iron. The Ougrée Works require 8l. 16s. per ton for No. 3 plates. Axles stand at 11l. 4s. per ton. March will witness the inauguration of a steam tramway between Milan and Pavia. This fact is of some interest to Belgian industrialists, as all the fixed plant and rolling stock for this tramway has been made in Belgium. The rails come from the Angleur works, and the accessories from the Belgian Metallurgical Company, which has also furnished the rolling stock. MM. Nicaise and Deleuve have obtained a contract for 177 trucks for the Andalusian Railways; this order was obtained by a Belgian firm in spite of English competition. An adjudication of locomotives for the Belgian State Railways is expected shortly. The Strépy, Bracquignies, Acoz, and Marcinelle Companies are re-lighting furnaces. In the first eleven months of last year Belgium exported 27,158 tons of iron rails, as compared with 29,171 tons in the corresponding period of 1878.

The next adjudication of coal for the Belgian State Railways will give a more definite tone to the Belgian coal markets. The strike in the Borinage has not acquired a worse aspect; on the contrary, the men have assumed a quieter tone, and many of them have returned to their work. The scarcity of rolling stock on the Belgian State Railways has become intense, and it would have been still more severely felt but for the strike in the Borinage. As it is the Charleroi Coalowners' Association has made sharp complaints on the subject to the Belgian Minister of Public Works. The Seraing Company quotes unwashed coke at 1l. per ton. It appears that during the first eleven months of 1879 Belgium imported 656,794 tons of coal and 10,138 tons of coke, as compared with 635,723 tons of coal and 19,170 tons of coke in the corresponding period of 1878. On the other hand, the exports of coal from Belgium in the first eleven months of last year amounted to 3,994,363 tons of coal and 548,129 tons of coke, as compared with 3,485,750 tons of coal and 522,473 tons of coke in the corresponding period of 1878.

Coal consumers were supplied with some difficulty in Paris during the severe weather, from which the French capital has at length been relieved. Retail dealers in coal sold it in as small quantities as ½ cwt., and that at the rate of 3s. 4d. per cwt., or 66s. 8d. per ton. Some of these gentry must have made some very pretty pickings during the season of trial. However, even before the return of mild weather prices began to fall as the condition of the streets improved, and the railway companies made large deliveries. Industrial coal also became very dear in Paris during the late severe weather, in consequence of the serious cartage difficulties which prevailed.

DEPHOSPHORISATION OF IRON.—Another invention in this important matter has been brought forward by Mr. H. C. BULL, who proposes to eliminate the phosphorus by converting it into phosphured hydrogen. This he claims to do, in conjunction with the Bessemer converting process, by introducing a jet of steam to play upon the molten iron, in connection with the air blowing from the blast-engine. As soon as the carbon, silicon, or manganese are eliminated from the metal, the steam-jet is to be turned on, the steam becoming decomposed, and the hydrogen uniting with the phosphorus to form phosphured hydrogen. Mr. Bull's experiments in South Wales appear to have met with success, although they have hitherto been conducted with metal from foreign ore, which are of richer quality than the native ores; but he entertains no doubt but that the same result will be arrived at in ores of poorer quality. Should this be the case, a great desideratum will have been obtained, and particularly as regards expense, for the only addition proposed by Mr. Bull to the existing plant is a steam-pipe leading from the engine or boilers into the air-pipes and communicating with the converter. By this simple means he believes that low grade ores can be made to produce good steel, without the more expensive arrangement of basic linings.

HOLLOWAY'S OINTMENT AND PILLS.—COUGHS, INFLUENZA.—The soothing properties of these medicaments render them well worthy of trial in all diseases of the respiratory organs. In common colds and influenza, the pills taken internally, and the ointment rubbed over the chest and throat, are exceedingly efficacious. When influenza is epidemic, this treatment is easiest, safest, and surest. Holloway's pills purify the blood, remove all obstacles to its free circulation through the lungs, relieve the over-gorged air tubes, and render respiration free, without reducing the strength, irritating the nerves, or depressing the spirits, such are the ready means of saving suffering when anyone is afflicted with cold, coughs, bronchitis, and other chest complaints, by which so many persons are seriously and permanently afflicted in most countries.



## PHOSPHOR BRONZE.

REGISTERED TRADE MARK.

THE BEST METAL FOR  
BEARINGS, SLIDE VALVES,  
PUMPS,  
STEAM FITTINGS, &c.,

Supplied in Ingots or Castings.

WIRE, SHEETS, TUBES, &amp;c.

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THE PHOSPHOR BRONZE COMPANY

(LIMITED):

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## ALEX. CHAPLIN AND CO.,

CRANSTONHILL ENGINE WORKS, GLASGOW

PATENTERS AND SOLE MANUFACTURERS OF

CHAPLINS' PATENT STEAM CRANES, HOISTS,

LOCOMOTIVES, AND OTHER ENGINES AND BOILERS

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SOLID DRAWN BRASS AND COPPER  
BOILER TUBES,

FOR LOCOMOTIVE OR MARINE BOILERS,

EITHER

MUNTZ'S OR GREEN'S PROCESS.

MUNTZ'S METAL COMPANY (LIMITED),

FRENCH WALLS,

NEAR BIRMINGHAM.

## READE BROTHERS,

TOWER VARNISH WORKS,

NECHELLS, BIRMINGHAM,

MANUFACTURERS OF

High-class Varnishes and  
Japan,

For COACH &amp; RAILWAY WAGON BUILDER.

ENGINE BUILDERS, CONTRACTORS, COLLIERY and

GENERAL ENGINEERS,

LAMP MANUFACTURERS,

AGRICULTURAL IMPLEMENT MANUFACTURERS,

DECORATORS, &amp;c.

Lists and Samples on application.

## PATENT

## STEEL TRAMS AND TIPPING TRUCKS.

STEEL (OR IRON) TRAMS AND TIPPING TRUCKS  
Patented in Europe, America, and British South Africa  
Lightest and strongest made.

R. HUDSON,

GILDERSOME FOUNDRY, NEAR LEEDS.

MEXICO, NEW MEXICO, ARIZONA, UTAH, NEVADA  
AND CALIFORNIA.

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MINING AND CIVIL ENGINEER,

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Has 24 years' experience in Mining and Smelting, and 10 years experience in American Business and Law, offers his services at moderate charges for Reporting on Mining and other Property in any of the above-named States or Territories gives correct, safe, and responsible advice as to securing full titles and possession and, as to best mode of utilising the property, will assist in settling existing difficulties by compromise, and in disposing of developed mining property when held at real value; offers his assistance for securing undeveloped mining properties at home prices. As to care taken in reporting, reference is made to the *Mining Journal* Supplement, April 1, 1876, containing a report on property of the Maxwell Land Grant and Railway Company; as to technical standing, to the prominent men of the trade—compare *Mining Journal* of Aug. 30 and Nov. 31, 1872, and *New York Engineering and Mining Journal*, Feb. 28, 1874.

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THE COLLIERY READY-RECKONER AND WAGES  
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## PARIS EXHIBITION, 1878.

GOLD AND SILVER MEDALS AWARDED for  
Steam-Engines & Boilers, also the Special Steam Pump,  
and Compound Pumping Engine.

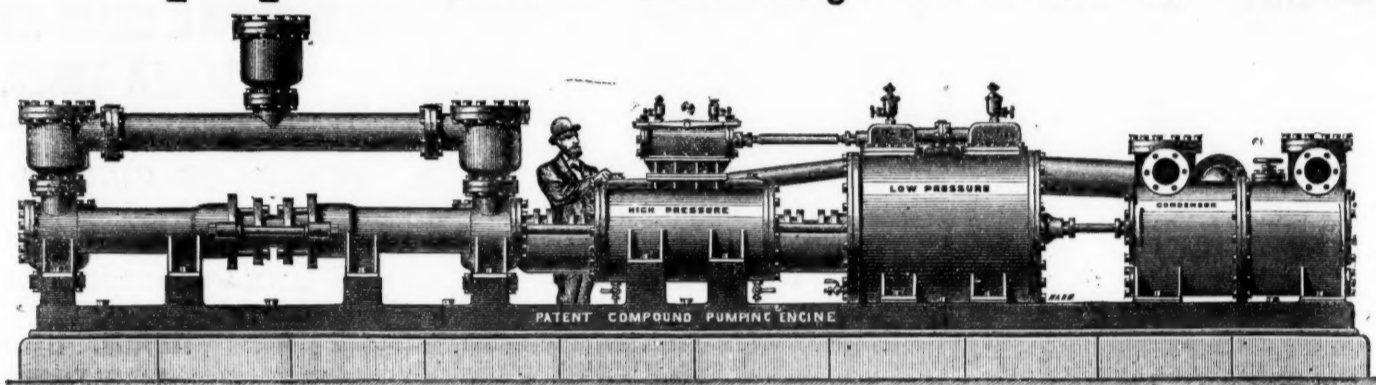


## TANGYE BROTHERS AND HOLMAN,

CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,  
AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS, SOHO.

TANGYE'S DIRECT-ACTING  
COMPOUND PUMPING ENGINE,

For use in Mines, Water Works, Sewage Works,  
And all purposes where Economy of Fuel is essential.



TANGYE'S DIRECT-ACTING COMPOUND PUMPING ENGINE, WITH AIR-PUMP CONDENSER.

TANGYE'S COMPOUND PUMPING ENGINE COMBINES SIMPLICITY, CERTAINTY OF ACTION, GREAT ECONOMY  
IN WORKING, COMPACTNESS, AND MODERATE FIRST COST.

This Engine will be found the most simple and economical appliance for Mine Draining, Town Water Supply, and General Purposes of Pumping ever introduced, and as regards Mine Draining, the first cost is very moderate compared with the method of raising water from great depths by a series of 40 or 50 fm. lifts. No costly engine-houses or massive foundations, no repetition of plunger lifts, ponderous connecting rods, or complication of pitwork, are required, while they allow a clear shaft for hauling purposes. In this Engine the economical advantages resulting from the expansion and condensation of steam are very simply and effectively obtained. The steam after leaving the high-pressure cylinder is received into and expanded in the low-pressure cylinder, and is thus used twice over before being exhausted into the condenser or atmosphere.

The following first-class Testimonials will bear evidence as to the efficiency and economy of the Engine:—

## TESTIMONIALS OF TANGYE'S COMPOUND PUMPING ENGINE.

21" Newcastle and Gateshead Water Company, Newcastle-on-Tyne, Oct. 20, 1879.

36" x 10" x 48" COMPOUND CONDENSING STEAM PUMPING ENGINE.

Messrs. Tangye Brothers.

GENTLEMEN,—In reply to your enquiry as to the efficiency of the two pairs of Compound Condensing Engines recently erected by you for this company at our Gateshead Pumping Station, I have great pleasure in informing you that they have far surpassed my expectations, being capable of pumping 50 per cent. more water than the quantity contracted for; and by a series of experiments I find they work as economically as any other engine of the compound type, and will compare favourably with any other class of pumping engine. By the simplicity of their arrangement and superior workmanship they require very little attendance and repairs, and the pumps are quite noiseless. A short time ago I had them tried upon air by suddenly shutting off the column, and found they did not run away, thus showing the perfect controlling or governing power of the Floyd's Improved Steam-moved Reversing Valve. I will thank you to forward the other two pairs you have in hand for our Benwell Pumping Station.

(Signed)

Yours respectfully,  
JOHN R. FORSTER, Engineer.

The Chesterfield and Boythorpe Colliery Company (Limited),

Registered Office, Boythorpe, near Chesterfield, Oct. 1, 1879.

21"

36" x 12" x 48" DOUBLE RAM COMPOUND CONDENSING STEAM PUMPING ENGINES.

Messrs. Tangye Brothers.

Supplied in January, 1878.

GENTLEMEN,—Referring to the above, which we have now had working continuously night and day for the last 12 months, we are glad to say that it is giving us every satisfaction. It is fixed about 400 feet below the surface, the steam being taken down to it at pressure of 45 lbs. per square inch. We can work the pump without any difficulty at 28 strokes per minute—224 ft. piston speed. The pumping power is enormous. The vacuum in the condenser being from 1½ to 13 lbs. The pump is easily started, and works well and regularly. The amount of steam taken being much less than we anticipated. We consider the economy in working very satisfactory indeed. The desire for power and economy at the present day will certainly bring this pump into great requisition.

Yours truly,  
(Signed)

M. STRAW, Manager.

## SIZES AND PARTICULARS.

	8	8	8	10	10	10	10	12	12	12	12	14	14	14	14
Diameter of High-pressure Cylinder.....In.	8	8	8	10	10	10	10	12	12	12	12	14	14	14	14
Ditto of Low-pressure Cylinder.....In.	14	14	14	18	18	18	18	21	21	21	21	24	24	24	24
Ditto of Water Cylinder.....In.	4	5	6	5	6	7	8	6	7	8	10	7	8	10	12
Length of stroke.....In.	24	24	24	24	24	24	24	24	24	24	24	36	36	36	36
Gallons per hour approximate.....	3900	6100	8800	6100	8800	12000	15,650	8,800	12,000	15,650	24,450	12,000	15,650	24,450	35,225
Height in feet water can be raised with 40 lbs. pressure per square inch in cylinder.....	360	330	160	360	250	184	140	360	264	202	130	360	275	175	122
Ditto ditto ditto—with Holman's Condenser.....	480	307	213	480	333	245	187	480	352	269	173	480	367	234	162
Ditto ditto ditto—with Air-pump Condenser.....	600	384	267	600	417	306	335	600	440	337	216	600	459	203	203

## CONTINUED.

	16	16	16	16	18	18	18	18	21	21	21	24	24	24	30
Diameter of High-pressure Cylinder.....In.	16	16	16	16	18	18	18	18	21	21	21	24	24	24	30
Ditto of Low-pressure Cylinder.....In.	28	28	28	28	32	32	32	32	36	36	36	42	42	42	52
Ditto of Water Cylinder.....In.	8	10	12	14	8	10	12	14	10	12	14	10	12	14	14
Length of stroke.....In.	36	36	36	36	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate.....	15,650	24,450	35,225	47,950	13,650	24,450	35,225	47,950	24,450	35,225	47,950	24,450	35,225	47,050	35,225
Height in feet water can be raised with 40 lbs. pressure per square inch in cylinder.....	360	230	160	118	456	292	202	149	397	276	202	518	360	264	562
Ditto ditto ditto—with Holman's Condenser.....	480	307	213	154	603	389	269	198	528	363	269	691	480	352	750
Ditto ditto ditto—with Air-pump Condenser.....	600	384	267	191	750	486	337	248	660	450	337	864	600	440	937

## PRICES GIVEN ON RECEIPT OF REQUIREMENTS.

Any number of these Engines can be placed side by side, to work in conjunction or separately as desired, thereby multiplying the work of one Pump to any extent.

NORTHERN DEPOT:—TANGYE BROTHERS, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.

TWO GOLD MEDALS.



SOLE MAKERS—

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# FOX'S PATENT CORRUGATED FURNACE FLUES,

NOW APPLIED TO OVER

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IND. H.P.

PARIS, 1878.



PRICE LISTS AND  
PARTICULARS  
ON APPLICATION.

Awarded Gold Medal, Paris Exhibition, 1878.

## HADFIELD'S STEEL FOUNDRY COMPANY.

FIRST PRIZE MEDALS AT LEEDS, MANCHESTER, AND  
WREXHAM EXHIBITIONS, 1875 AND 1876.

ATTERCLIFFE, SHEFFIELD,

DEVOTE THEIR EXCLUSIVE ATTENTION TO THE MANUFACTURE OF

**CRUCIBLE STEEL CASTINGS,**

FOR

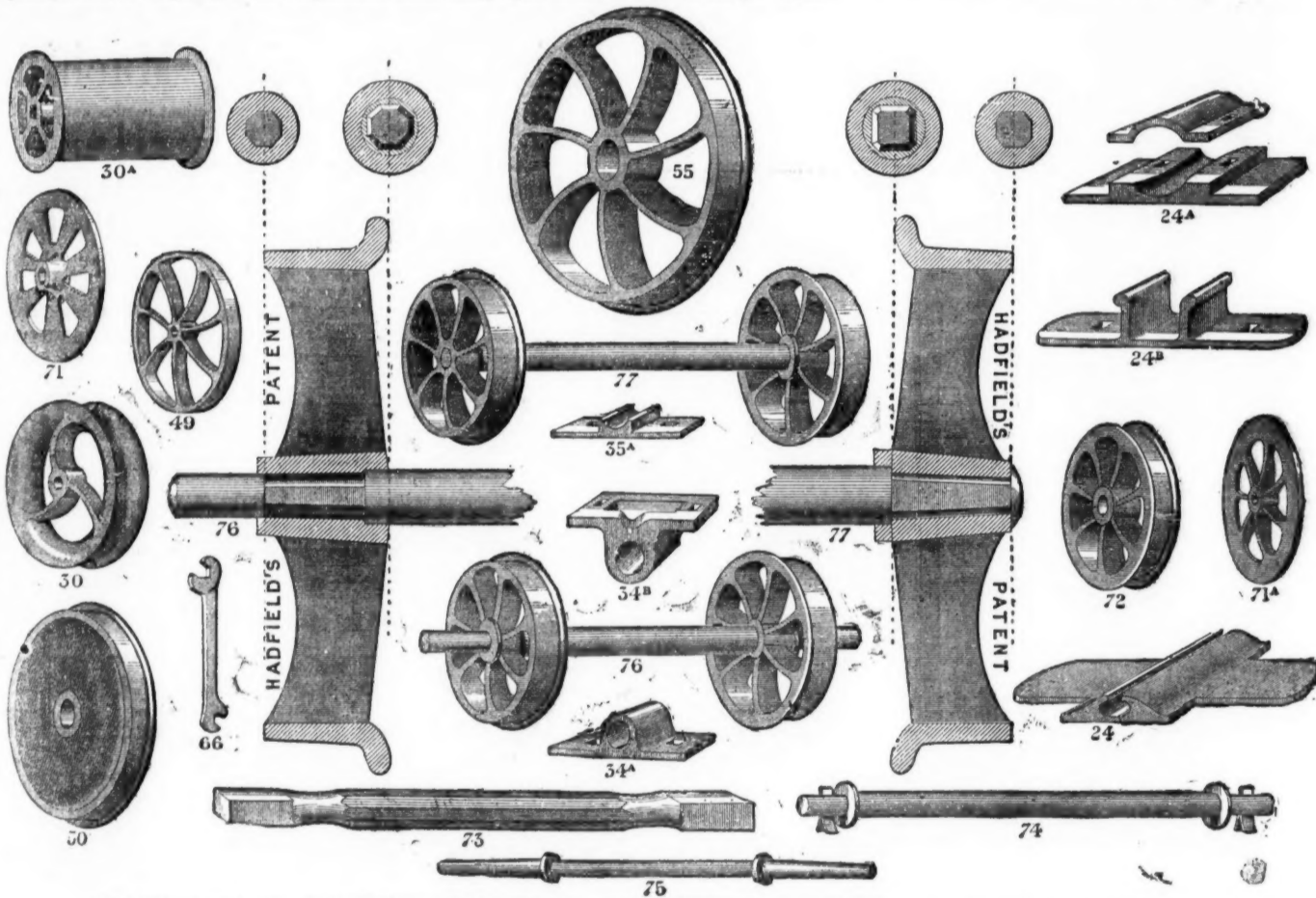
Engineering & Mining Purposes,

AND ARE THE SOLE MAKERS OF

**HADFIELD'S CRUCIBLE STEEL WHEELS.**

One of our departments is specially adapted for the manufacture of these Wheels (as shown below), for Collieries, Ironstone Mines, Slate Quarries, Ironworks, Lead Mines, &c. &c. We have made, and are now making, many HUNDRED THOUSANDS; and having Patented a New Method of Fitting Wheels upon axles, being cheap, effective, and expeditious, we can execute orders entrusted to us with promptitude, our capacity in this department alone being equal to about 2000 wheels per week.

N.B.—Prices per Set of Wheels and Axles, fitted complete, forwarded on receipt of diameter of wheel on tread, depth of tread, real gauge, and thickness of axles and rolling load.



### HADFIELD'S PATENT METHOD OF FITTING WHEELS UPON AXLES.

The advantages of the above system are that the Wheels being forced upon a Taper Square-ended Axle, by Machinery, and then riveted (the machine securing truth), it is impossible that they can come loose or get within gauge. They are very cheaply fitted on, and run exceedingly true.

We construct the Arms of wheels upon the curved principle (as shown in the drawings above), consequently the shrinkage or cooling of the Castings is not interfered with, thus securing the greatest advantages of our very strong material.

CRUCIBLE CAST-STEEL WHEELS, when cast by us, are made from one-third to one-half lighter than Cast-Iron. They cannot be broken while working, even with rough usage, and will wear at least twelve times as long as Cast-Iron, thus saving animal and steam power, and reducing wear and tear immensely.

We would also draw special attention to our INCLINE PULLEYS and CAGE GUIDES, the adoption of which will prove highly advantageous.

**MACHINE MOULDED STEEL GEAR WHEELS OF EVERY DESCRIPTION.**

## INCREASED VALUE OF WATER-POWER.

### MacADAM'S VARIABLE TURBINE.

This Wheel (which is now largely in use in England, Scotland, and Ireland) is the only one yet invented which gives proportionate power from both large and small quantities of water. It can be made for using a large winter supply, and yet work with equal efficiency through all variations of quantity down to a fifth, or even less if required. It is easily coupled to a steam-engine, and in this way always assists it by whatever amount of power the water is capable of giving, and therefore saves so much fuel.

This Turbine is applicable to all heights of fall. It works immersed in the tail-water, so that no part of the fall is lost, and the motion of the Wheel is not affected by floods or back-water.

References to places where it is at work will be given on application to—

**MacADAM BROTHERS AND CO., BELFAST.**

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**ENGINEERS, CONTRACTORS, &c.**

FOR EVERY DESCRIPTION OF PLANT FOR

**Collieries, Mines, Brickworks, &c.**

At the PARIS EXHIBITION the Jurors have Awarded

# THE GOLD MEDAL, THE SILVER MEDAL, AND HONOURABLE MENTION FOR MY LATEST PATENTED STONE BREAKERS AND ORE CRUSHERS.

Stones broken equal, and Ores better, than by hand, at one-tenth the cost.

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ORIGINAL PATENTEE AND SOLE MAKER OF BLAKE'S

# Improved Patent Stone Breakers & Ore Crushers.

New Patent Reversible Jaws,  
in Sections, with Patent  
Faced Backs.

NEW PATENT ADJUSTABLE  
TOGGLES.

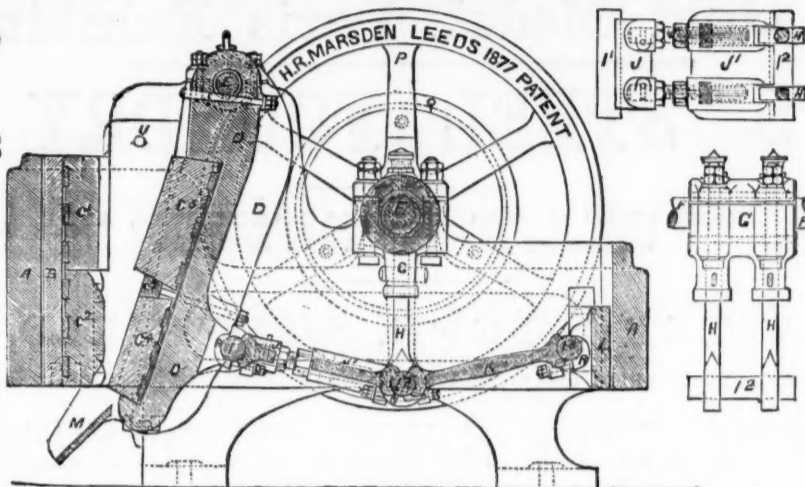
OVER 2500 IN USE.

New Patent Draw-back  
Motion.

NEW PATENT STEEL TOGGLE BEARINGS.

70

PRIZE MEDALS.



### READ THIS—

Wharhole Lime Works, Maryport, Whitehaven,  
November 7, 1873.  
H. R. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.  
DEAR SIR,—The machine I have in use is one of the largest  
size, 24 in. by 12 in. The quantity we are breaking daily with  
this one machine is 250 tons, the jaw being set to break to a  
size of 2½ in. We have, however, frequently broken over  
300 tons per day of ten hours, and on several occasions over  
350 tons during the same period. The stone we break is the  
blue mountain limestone, and is used as a flux in the various  
ironworks in this district. We have now had this machine in  
daily use for over two years without repairs of any kind, and  
have never had occasion to complain of any inconvenience in  
using the machine. I hope the one you are now making for  
me may do its work equally well. The cost—including  
ENGINE-POWER, COALS, ENGINEMAN, FEEDING, and all EXPENSES  
OF EVERY KIND—is just 3d. per ton. Should any of your  
friends feel desirous of seeing one of your machines at work,  
I shall have much pleasure in showing the one alluded to.  
I am, dear Sir, yours very truly,  
WILLIAM MILLER.

### AND THIS—

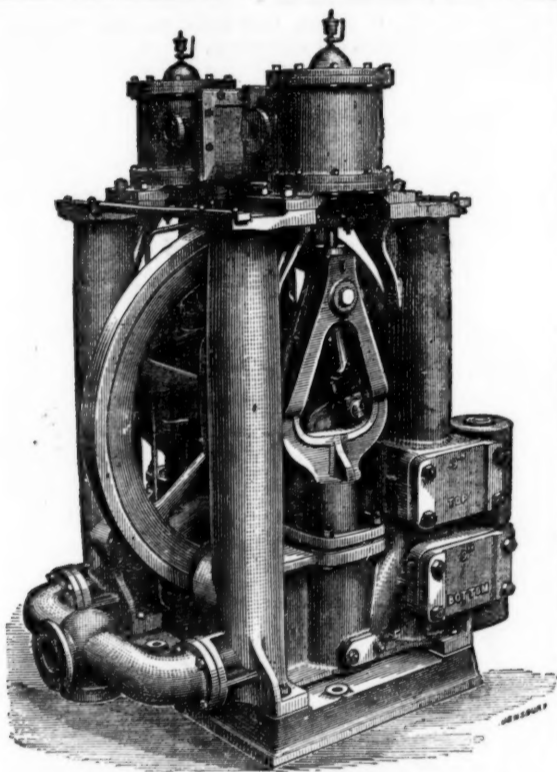
Wharhole Lime Works, Aspatria, Cumberland,  
July 11th, 1878.  
H. R. MARSDEN, Esq., Soho Foundry, Leeds.  
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